Q52. What kinds of appliance(s) did you buy?

Response Option	Count
Refrigerator	4
Stand-alone Freezer	0
Dishwasher	3
Clothes washer	5
Clothes dryer	6
Oven	0
Microwave	1
Other	0
Don't know	0

Q53. Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=7)
Refrigerator	4	57%
Stand-alone Freezer	0	0%
Dishwasher	2	29%
Clothes washer	4	57%
Clothes dryer	5	71%
Oven	0	0%
Microwave	1	14%
Other	0	0%

Q54. Does the new clothes dryer use natural gas?

Response Option	Count
Yes- it uses natural gas	1
No – does not use natural gas	5
Don't know	0

Q55. What type of heating or cooling equipment did you buy?

Response Option	Count	Percent (n=2)
Central air conditioner	1	50%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	0	0%
Geothermal heat pump	0	0%
Boiler	0	0%

Response Option	Count	Percent (n=2)
Furnace	0	0%
Wifi-enabled thermostat	0	0%
Other (please specify in the box below)	0	0%
Don't know	1	50%

Q55a. Other…

Response Option	Count
Not applicable	0

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

Response Option	Count
Not applicable	0

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=1)
Central air conditioner	1	100%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	0	0%
Geothermal heat pump	0	0%
Boiler	0	0%
Furnace	0	0%
Wifi-enabled thermostat	0	0%
Other (please specify in the box below)	0	0%
Don't know	0	0%

Q58. How many windows did you install?

Response Option	Count
10	1

Q59. Did you add insulation to your attic, walls, or below the floor? [MULTIPLE RESPONSE]

Response Option	Count
Attic	5
Walls	3
Below the floor	1
Don’t know	0

Q60a. Approximately what proportion of the attic space did you add insulation?

Response Option	Count
50	1
50%	1
90%	1
Don't know	0

Q60b. Approximately what proportion of the wall space did you add insulation?

Response Option	Count
3	1
50%	1
Don't know	0

Q60c. Approximately what proportion of the below the floor space did you add insulation?

Response Option	Count
50%	1

Q61. Do you know how many of LEDs you installed at your property?

Response Option	Count
Yes	25
Don't know	3

Q61a. How many of LEDs did you install in your property?

Response Option	Count
2	2
3	1
4	2
5	1
6	7
8	1
8 plus 2 from the box	1
10	2
12	1
15	1
20	4
25	1

Response Option	Count
30	1
Don't know	0

Q62. How many of CFLs did you install in your property?

Response Option	Count
Yes	1
Don't know	1

Q62. Number of CFLS installed…

Response Option	Count
2	1

Q63. Does the new water heater use natural gas?

Response Option	Count
Yes - it uses natural gas	1
No – does not use natural gas	0
Don't know	0

Q64. Which of the following water heaters did you purchase?

Response Option	Count
A traditional water heater with a large tank that holds the hot water	0
A tankless water heater that provides hot water on demand	1
A solar water heater	0
Other	0
Don't' know	0

Q65. Is the new water heater an ENERGY STAR model?

Response Option	Count
Yes	1
No	0
Don't know	0

Q66. Which of the following types of housing units would you say best describes your home? It is . . .?

Response Option	Count	Percent (n=172)
Single-family detached house	102	59%
Single-family attached home (such as a townhouse or condo)	9	5%
Duplex, triplex or four-plex	3	2%
Apartment or condominium in a building with 5 units or more	22	13%
Manufactured or mobile home	32	19%
Other	2	1%
Don't know	1	1%

Q66. Other…

Response Option	Count
Buying own house soon and will want to make more energy efficient	1
Single family log cabin	1

Q67. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

Response Option	Count	Percent (n=172)
Less than 500 square feet	1	1%
500 to under 1,000 square feet	12	7%
1,000 to under 1,500 square feet	42	24%
1,500 to under 2,000 square feet	20	12%
2,000 to under 2,500 square feet	22	13%
2,500 to under 3,000 square feet	16	9%
Greater than 3,000 square feet	17	10%
Don't know	42	24%

Q68. Do you or members of your household own your home, or do you rent it?

Response Option	Count	Percent (n=172)
Own / buying	111	65%
Rent / lease	61	36%
Occupy rent-free	0	0%

Don’t know	0	0%

Q69. Including yourself, how many people currently live in your home year-round?

Response Option	Count	Percent (n=172)
I live by myself	8	5%
Two people	25	15%
Three people	42	24%
Four people	54	31%
Five people	30	17%
Six people	9	5%
Seven people	3	2%
Eight or more people	1	1%
Don't know	0	0%

Q70. What was your total annual household income for 2017, before taxes?

Response Option	Count	Percent (n=172)
Under $20,000	27	16%
$20,000 to under $30,000	19	11%
$30,000 to under $40,000	18	10%
$40,000 to under $50,000	14	8%
$50,000 to under $60,000	11	6%
$60,000 to under $75,000	9	5%
$75,000 to under $100,000	19	11%
$100,000 to under $150,000	20	12%
$150,000 to under $200,000	9	5%
$200,000 or more	3	2%
Don’t know	4	2%
Prefer not to say	19	11%

Q71. What is the highest level of education achieved among those living in your household?

Response Option	Count	Percent (n=172)
Less than high school	1	1%
Some high school	7	4%
High school graduate or equivalent (such as GED)	33	19%
Trade or technical school	4	2%
Some college (including Associate degree)	50	29%

Response Option	Count	Percent (n=172)
College degree (Bachelor's degree)	38	22%
Some graduate school	5	3%
Graduate degree, professional degree	32	19%
Doctorate	1	1%
Don't know	0	0%
Prefer not to say	1	1%

G.4 Student Parent Survey - DEC

Q2. Before today, did you know the kit you received was sponsored by Duke Energy?

Response Option	Count	Percent (n=334)
Yes	313	94%
No	19	6%
Don't know	2	1%

Q3. How did you learn that the kit was sponsored by Duke Energy? [Select all that apply]

Response Option	Count	Percent (n=313)
Classroom materials brought home by child	183	58%
My child's teacher/school	92	29%
Information material included in/on the kit	92	29%
Other	33	11%
Don't know	6	2%

Q3. Other…

Response Option	Count
A friend	1
Advertisement sent home from school that we signed up for	1
By a letter	1
contest sponsored at daughter's school	1
Duke Energy	1
Flyer	1
Friend told me	1
From Duke Power.	1
Had to fill something out online and it was on the box as well	1

Response Option	Count
Heard some of the parents talking about it.	1
I signed up for it online.	1
I use to work as a substitute teacher part time.	1
I work for Duke HEHC Program	1
In the papers that came with it	1
Informed by neighbors on the next door app	1
Internet	1
My daughter shared her experiences with me prior to receiving the materials	1
My wife teaches at the middle school level.	1
Neighbor is a retired Duke Employee.	1
Network neighborhood site	1
Online	2
Pervious Experience	1
Previous participation in the LED kit.	1
PTO promotion of kit!	1
Requested it when I moved into my house	1
Saw information about the kit online	1
School's Social Media	1
Teacher told me	1
Website	3
When it arrived I was told by my grandson it was from Duke	1

Q3a. How did you hear about the opportunity to receive the kit from Duke Energy? [Select all that apply]

Response Option	Count	Percent (n=334)
Classroom materials brought home by child	238	71%
School newsletter	57	17%
Email from my child's teacher/school	46	14%
School website or school web portal	20	6%
In-person conversations with my child's teacher	14	4%
Saw a poster at my child's school	12	4%
After hours event at my child's school	8	2%
Other (please specify in the box below)	44	13%
Don't know	10	3%

Q3a. Other…

Response Option	Count
A friend	1
Assembly sponsored by Duke Energy.	1
Call from my child's school	1
Class Dojo message from school	1
Contest at my daughter's school	1
Duke Energy Website	1
Either something we filled out or something that came home with the kids from school	1
Facebook	1
Flyer from school	2
Friend told me.	1
From my niece Stacey Johnson	1
From the school	1
Grand daughter brought home a card	1
Heard about it from another child's parent	1
Heard some of the parents talking about it.	1
I saw it on my light bill.	1
It just came in the mail	1
Letter from the school	1
Monthly Bill	1
My child	1
My child told me.	1
My wife teaches at the school.	1
Neighbors posted on nextdoor app	1
Network neighborhood site	1
Once it arrived	1
Pervious Experience	1
Room Parent emails PTO newsletter PTO Facebook posts	1
Saw it on Facebook	1
School	1
School Facebook page	1
School sent me a brochure	1
Social media from school	1
Supporter of saving the environment, step daughter brought home paper from school	1
The school may have given us flyers	1
Was told by my child	1

Response Option	Count
Website	3
When it arrived I was told it was from Duke by my grandson	1
Word of mouth from family	1
Work for duke	1

Q4. Did you read the information about how to save energy in the booklet that came in the kit?

Response Option	Count	Percent (n=334)
Yes	245	73%
No	62	19%
Don't know	27	8%

Q5. On a scale from 0 to 10 where 0 is not at all helpful and 10 is very helpful, how helpful was the information in the kit in identifying ways your household could save energy at home?

Response Option	Count	Percent (n=245)
0	1	0%
1	1	0%
2	0	0%
3	2	1%
4	5	2%
5	17	7%
6	17	7%
7	42	17%
8	43	18%
9	24	10%
10 - Very helpful	93	38%
Don’t know	0	0%

Q6. What might have made the information more helpful?

Response Option	Count
A chart of the options and other ways to save.	1
Adding more statistical data to prove that what’s actually stated is true	1
Better as video than booklet.	1
Could have used more specific info on insulating pipes.	1

Response Option	Count
Different ways to save energy.	1
I already knew the info. I'm sure it would be helpful to someone who didn't already know.	1
I did this line of work for a living so I already knew the info	1
I don't know but it was stuff I already knew	1
I was pretty much aware of all the ways to save energy. I am very conservative with everything.	1
Including information to help renters	1
It was kind of confusing, need more detail	1
It was too long	1
It was very helpful. We rent so there is only so much we can do.	1
Just didn't apply to me	1
Low income resources	1
More ideas on savings.	1
More incentive to use the items... Example rebates...note with power bill telling how much your own home saved after using the items make it more personal not a average	1
More info for energy savings in a mobile home	1
More options and more detailed information and instructions.	1
More pictures. More info	1
Sleep	1
Tell how to really save energy	1
The reading	1
Tips	1
We tend to try our best at club conservation, so I'm not the best to think of with changing minds.	1
Well the showerheads need to be a little bigger for my shower	1

Q7. In addition to sending the energy saving kits, Duke Energy sponsored a program about energy and energy efficiency at your child's school, which included classroom materials and an in-school performance by the National Theatre for Children. Were you aware of this program before today?

Response Option	Count	Percent (n=334)
Yes	104	31%
No	228	68%
Don't know	2	1%

Q9. Where did you hear about this program?

Response Option	Count	Percent (n=104)
From my child/children	80	77%
From a teacher/school administrator	29	28%
On the Duke Energy website	15	14%
Other	5	5%
Don't remember	2	2%

Q9a. Other…

Response Option	Count
From the school	1
Network neighborhood site	1
PTO	1
School's website.	1
Through the school newsletter	1

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?

Response Option	Count	Percent (n=334)
Yes	312	93%
No	22	7%
Don’t know	0	0%

Q12. Which of the items did you install, even if they were taken out later?

Response Option	Count	Percent (n=312)
Showerhead	153	49%
Kitchen faucet aerator	109	35%
Bathroom faucet aerator	104	33%
Night light	259	83%
Energy efficient light bulb(s) (LEDs)	297	95%
Insulator gaskets for light switches and electricity outlets	103	33%
I never installed any of the items from the kit	0	0%

Q13. In addition to the night light, there were two LED light bulbs in the kit. Did you install one or both of the LED light bulbs in the kit?

Response Option	Count	Percent (n=297)
Yes - I installed both LEDs	237	80%
No - I installed only one LED light bulb	50	17%
Don't know	10	3%

Q15. How many of the light switch gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

Response Option	Count	Percent (n=103)
None	3	3%
One	11	11%
Two	31	30%
Three	7	7%
Four	44	43%
Don't know	7	7%

Q16. How many electrical outlet gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

Response Option	Count	Percent (n=103)
None	4	4%
One	6	6%
Two	29	28%
Three	5	5%
Four	20	19%
Five	2	2%
Six	5	5%
Seven	1	1%
Eight	18	17%
Don't know	13	13%

Q17. Overall, how satisfied are you with the item[s] you installed? Please use 0 to 10 scale, where 0 is very dissatisfied and 10 is very satisfied. How satisfied are you with...

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total

Showerhead	1%	1%	1%	1%	1%	5%	3%	13%	13%	10%	50%	1%	153
Kitchen faucet aerator	2%	0%	1%	1%	1%	5%	3%	7%	8%	3%	67%	3%	109
Bathroom faucet aerator	2%	1%	0%	3%	0%	5%	3%	9%	9%	7%	62%	1%	104
Night light	0%	1%	0%	1%	0%	1%	1%	3%	10%	8%	75%	0%	259
Energy efficient light bulbs (LEDs)	1%	0%	0%	1%	0%	0%	2%	3%	5%	10%	77%	0%	297
Insulator gaskets	0%	0%	0%	1%	2%	2%	1%	6%	14%	7%	59%	9%	103

Q17a. Can you please explain any dissatisfaction you had with the showerhead?

Response Option	Count
Absolutely no water pressure. Takes forever to rinse soap off. Had another water saver head and it had tons of pressure. Uninstalled the free one after 2 days. I was itchy because soap would not rinse off without leaving the water on forever. I feel I used more water using this head because I had to leave the water on longer.	1
I wish there was flow from the center of the shower head as well as the circle. It makes washing longer hair a little harder to get the shampoo out.	1
It was not like the one we already had installed. The one we had was flatter and spread more water.	1
It's a dumb criticism, but it doesn't look as cool as it could.	1
Live in apartment it isn't dissatisfaction with the shower head but with the general water pressure at apartment	1
Pressure was very poor	1
Shower head leaks water	1
The water flow is different and we have to get used to it.	1
Too slow	1
Very slow	1

Response Option	Count
Water flow pressure was very low. Took longer to wash out soap or to clean off!	1

Q17b. Can you please explain any dissatisfaction you had with the kitchen faucet aerator?

Response Option	Count
Came out to slow	1
Didn't properly fit right on the sink.	1
It kept leaking even when the water was shut off so i had to put the old one back on.	1
It made water squirt out everywhere	1
It was too large for my faucet, it needed an additional adapter	1
Just don't like the loss of flow	1
Low water pressure. Very hard to rinse off dishes and takes longer!	1
Not saving	1
the only con is the kitchen water doesn't have as much water power/pressure when washing as it used to	1
There was not enough pressure	1
We couldn’t install it correctly. Wasn’t matching the sink I believe.	1

Q17c. Can you please explain any dissatisfaction you had with the bathroom faucet aerator?

Response Option	Count
Cut back too much water	1
Didn't properly fit right.	1
It didn’t fit our faucet correctly	1
Low water pressure and so wouldn't even wash tooth paste off tooth brushes!! Removed them all.	1
Made water squirt out everywhere	1
Not saving	1
Sprays water out	1

Q17d. Can you please explain any dissatisfaction you had with the night light?

Response Option	Count
I'd prefer it to have an on/off switch	1
I'm not really sure what the nightlight does or how it will save me energy at this time.	1
It is not bright enough.	1
It's not very bright	1

Response Option	Count
No just wasn't needed.	1
Not bright enough for my needs	1
Not saving	1
Nothing but an energy user with little helping of light	1
very happy with the night light	1
Wasn't bright enough for my child	1

Q17e. Can you please explain any dissatisfaction you had with the energy efficient light bulbs (LEDs)?

Response Option	Count
Blink sometimes	1
Not a huge fan of the type of lighting they provide	1
Not enough	1
Not saving	1
There are not as bright. I brought lights that were brighter.	1
They were not bright enough for the area	1
They were too dim and it took a long time to actually get bright	1

Q17f. Can you please explain any dissatisfaction you had with the insulator gaskets?

Response Option	Count
I have an older home built in 1986. I have not noticed a difference in my home insulation since installing these. I installed them only on exterior walls.	1
I still feel air coming through.	1
Not saving	1

Q18. Have you since uninstalled any of the items from the kit that you had previously installed?

Response Option	Count	Percent (n=312)
Yes	30	10%
No	279	89%
Don't know	3	1%

Q19. Which of the items did you uninstall?

Response Option	Count (n=30)
Showerhead	13

Response Option	Count (n=30)
Kitchen faucet aerator	10
Bathroom faucet aerator	4
Night light	8
Energy efficient light bulbs (LEDs)	5
Insulator gaskets	1
Don't know	1

Q20. Why were those items uninstalled? Let's start with…

Q20a. the showerhead?

Response Option	Count
It was broken	1
Didn't like how it worked	8
Didn't like how it looked	2
Other – Leaks water	1
Other – Switched to handheld shower	1
Other – Wanted to install the one with the water line	1
Don't know	0

Q20b. the kitchen faucet aerator?

Response Option	Count
It was broken	1
Didn't like how it worked.	5
Didn't like how it looked.	0
Other – Couldn't install it correctly	1
Other – Did not have an adapter	1
Other – Had to install a filter Brita system	1
Other – Water kept leaking out of it even when the water was turned off.	1
Don't know	0

Q20c. the bathroom faucet aerator?

Response Option	Count
It was broken	0
Didn't like how it worked	2
Didn't like how it looked	0
Other – Didn't fit correctly	1

Response Option	Count
Other – Sprays water out instead of the normal	1
Don't know	0

Q20d. the night light?

Response Option	Count
It was broken	2
Didn't like how it worked.	0
Didn't like how it looked.	1
Other – Child removed and lost the light	1
Other – To keep my lamps off	1
Other – Too bright	1
Other – Wasn't needed	1
Other – We had to move the night light to a different outlet.	1
Don't know	0

Q20e. the energy efficient light bulbs (LEDs)?

Response Option	Count
It was broken	2
Didn't like how it worked.	1
Didn't like how it looked.	1
Other – They went out	1
Other – Was not bright enough in the area but we did install into just a simple lamp	1
Don't know	0

Q20f. the insulator gaskets?

Response Option	Count
It was broken	0
Didn't like how it worked.	0
Didn't like how it looked.	1
Don't know	0

Q21. You said you haven't installed [INPUT ONLY THOSE ITEMS IN Q12 IF Q12a-f = 2]. Which of those items do you plan to install in the next three months?

Response Option	Count	Percent (n=314)
Showerhead	63	20%

Kitchen faucet aerator	68	22%
Bathroom faucet aerator	82	26%
Night light	40	13%
Energy efficient lightbulbs (LEDs)	26	8%
Insulator gaskets	92	29%
Im not planning on installing any of these in the next three months.	106	34%

Q22. What's preventing you from installing those items? Let's start with….

Q22. Showerhead…

Response Option	Count	Percent (n=118)
Didn't know what that was	2	2%
Tried it, didn't fit	9	8%
Tried it, didn't work as intended (please explain in the box below)	6	5%
Haven't gotten around to it	11	9%
Current one is still working	33	28%
Takes too much time to install it / No time / Too busy	3	3%
Too difficult to install it, don't know how to do it	2	2%
Don't have the tools I need	1	1%
Don't have the items any longer (threw away, gave away)	1	1%
Already have an efficient showerhead	45	38%
Other (please specify in the box below)	21	18%
Don't know	2	2%

Q22. Kitchen faucet aerator…

Response Option	Count	Percent (n=156)
Didn't know what that was	9	6%
Tried it, didn't fit	32	21%
Tried it, didn't work as intended (please explain in the box below)	8	5%
Haven't gotten around to it	28	18%
Current one is still working	26	17%
Takes too much time to install it / No time / Too busy	2	1%
Too difficult to install it, don't know how to do it	4	3%
Don't have the tools I need	1	1%

Don't have the items any longer (threw away, gave away)	2	1%
Already have an efficient kitchen faucet aerator	34	22%
Other (please specify in the box below)	23	15%
Don't know	3	2%

Q22. Bathroom faucet aerator…

Response Option	Count	Percent (n=148)
Didn't know what that was	13	9%
Tried it, didn't fit	30	20%
Tried it, didn't work as intended (please explain in the box below)	6	4%
Haven't gotten around to it	32	22%
Current one is still working	15	10%
Takes too much time to install it / No time / Too busy	1	1%
Too difficult to install it, don't know how to do it	1	1%
Don't have the tools I need	3	2%
Don't have the items any longer (threw away, gave away)	2	1%
Already have an efficient bathroom faucet aerator	24	16%
Other (please specify in the box below)	25	17%
Don't know	4	3%

Q22. Energy efficient lightbulbs (LEDs)…

Response Option	Count	Percent (n=11)
Didn't know what that was	0	0%
Tried it, didn't fit	1	9%
Tried it, didn't work as intended (please explain in the box below)	0	0%
Haven't gotten around to it	1	9%
Current one is still working	2	18%
Takes too much time to install it / No time / Too busy	0	0%
Too difficult to install it, don't know how to do it	0	0%
Don't have the tools I need	0	0%
Don't have the items any longer (threw away, gave away)	0	0%
Already have LEDs	3	27%
Other (please specify in the box below)	3	27%

Don't know	1	9%

Q22. Night lights…

Response Option	Count	Percent (n=35)
Didn't know what that was	0	0%
Tried it, didn't fit	1	3%
Tried it, didn't work as intended (please explain in the box below)	2	6%
Haven't gotten around to it	10	29%
Current one is still working	5	14%
Takes too much time to install it / No time / Too busy	0	0%
Too difficult to install it, don't know how to do it	0	0%
Don't have the tools I need	0	0%
Don't have the items any longer (threw away, gave away)	1	3%
Other (please specify in the box below)	13	37%
Don't know	3	9%

Q22. Insulator gaskets…

Response Option	Count	Percent (n=139)
Didn't know what that was	12	9%
Tried it, didn't fit	7	5%
Tried it, didn't work as intended (please explain in the box below)	4	3%
Haven't gotten around to it	48	35%
Current one is still working	19	14%
Takes too much time to install it / No time / Too busy	10	7%
Too difficult to install it, don't know how to do it	9	6%
Don't have the tools I need	3	2%
Don't have the items any longer (threw away, gave away)	2	1%
Other (please specify in the box below)	27	19%
Don't know	9	6%

Q22a. Thinking of the items you installed, would you be interested in receiving any more of them from Duke Energy? If so, which ones?

Response Option	Count	Percent (n=326)

Yes, I would like another energy-efficient showerhead	79	24%
Yes, I would like another kitchen faucet aerator	45	14%
Yes, I would like more bathroom faucet aerators	47	14%
Yes, I would like more energy-efficient night lights	190	58%
Yes, I would like more energy-efficient light bulbs (LEDs)	254	78%
Yes, I would like more switch/outlet gasket insulators	49	15%
No, I am not interested in receiving any more of the items	32	10%
Don't know	79	24%

Q22b. What would be your preferred way to request these additional items?

Response Option	Count	Percent (n=293)
Internet	218	74%
Telephone	35	12%
Pre-paid postcard	66	23%
Other, please specify	5	2%
Don't know	7	2%

Q26. You said you installed the night light. Did the night light replace an existing night light?

Response Option	Count	Percent (n=251)
Yes	167	67%
No	83	33%
Don’t know	1	0%

Q27. Did the old nightlight have a bulb that you could take out and replace once it burned out?

Response Option	Count	Percent (n=167)
Yes	113	68%
No	50	30%
Don't know	4	2%

Q28. You said you installed at least one of the energy efficient lights. What type of bulb(s) did you replace with the energy efficient lightbulbs?

Response Option	Count	Percent (n=292)
All incandescent (old fashioned light bulb - likely purchased more than two years ago)	132	45%

All halogen (looks like an incandescent, but has a glass tube inside of the bulb)	8	3%
All CFL (spiral or twisty shaped bulb that fits into ordinary light fixtures)	123	42%
All LED (new bulb type that uses little electricity and lasts a long time)	12	4%
Some combination of bulb types (please specify which ones in the box below)	13	4%
Don't know	4	1%

Q29. In what rooms did you install the energy efficient lightbulbs that were included in the kit?

Response Option	Count	Percent (n=292)
Living room	131	45%
Dining room	20	7%
Bedroom	104	36%
Kitchen	56	19%
Bathroom	59	20%
Den	8	3%
Garage	4	1%
Hallway	25	9%
Basement	4	1%
Outdoors	5	2%
Other area (please specify in the box below)	11	4%
Don't Know	6	2%

Q30. Have you adjusted the temperature of your water heater based on the Hot Water Gauge Card included in your kit?

Response Option	Count	Percent (n=334)
Yes	57	17%
No	222	66%
Don't recall seeing the Hot Water Gauge Card	45	13%
Don't know	10	3%

Q31. Do you know what the old temperature setting on your hot water heater was?

Response Option	Count	Percent (n=57)
Yes	16	28%
No	41	72%

Q31a. Temperature setting...

Response Option	Count
120	2
128	1
130	3
140	4
155	1
160	1
Actually, it was not hot enough to read	1
The recommended for you	1
Very hot	1

Q32. And what was the new temperature setting you set your hot water heater to?

Response Option	Count
72	1
100	1
105	1
110	1
118	1
120	8
130	2
140	1
180	1
Low	1

Q33. Is the new water heater temperature setting still in place?

Response Option	Count	Percent (n=57)
Yes	51	90%
No	2	4%
Don't know	4	7%

Q34. Why did you change the water heater temperature a second time?

Response Option	Count
It was too cold for showers	1
Not hot enough	1

Q35. What is the fuel type of your water heater?

Response Option	Count	Percent (n=334)
Electricity	213	64%
Natural Gas	106	32%
Other (please specify in the box below)	3	1%
Don't know	12	4%

Q36. How old is your water heater?

Response Option	Count	Percent (n=334)
Less than five years old	111	33%
Five to nine years old	62	19%
Ten to fifteen years old	50	15%
More than fifteen years old	19	6%
Don't know	92	28%

Q37. If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

Response Option	Count	Percent (n=309)
Yes	119	39%
No	105	34%
Don't know	85	28%

Q38. What items would you have purchased and installed within the next year?

Response Option	Count	Percent (n=117)
Energy-Efficient Showerhead	24	21%
Kitchen faucet aerator	8	7%
Bathroom faucet aerator	7	6%
Energy-Efficient Night light	38	33%
Energy efficient lightbulbs (LEDs)	101	86%
Switch/Outlet Gasket Insulators	7	6%
No I would not have purchased any of the items	0	0%
Other	0	0%
Don't know	1	1%

Q39. If you had not received them for free in the kit, how many LED light bulbs would you have purchased?

Response Option	Count	Percent (n=83)
One	3	4%
Two	58	70%
Don't know	22	27%

Q40. Now, thinking about the water savings items that were provided in the kit - using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential" how influential were the following factors on your decision to install the water saving items from the kit? How influential was…

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
The fact that the items were free	3%	0%	1%	1%	1%	6%	4%	5%	8%	6%	64%	2%	191
The fact that the items were mailed to your house	1%	0%	1%	1%	0%	4%	1%	4%	7%	5%	76%	1%	191
The chance to win cash prizes for your household and school	8%	1%	3%	2%	2%	9%	3%	4%	5%	5%	57%	4%	191
Information in the kit about how the items would save energy	1%	0%	0%	2%	2%	7%	5%	6%	12%	13%	50%	3%	191
Information that your child brought home from school	1%	0%	2%	4%	2%	9%	3%	5%	13%	9%	48%	4%	191
Other information or advertisements from Duke Energy, including its website	8%	1%	1%	5%	2%	10%	6%	10%	11%	7%	37%	3%	191

Q41. Using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential" how influential were the following factors on your decision to install the lightbulbs from the kit? How influential was…

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
The fact that the items were free	3%	0%	1%	1%	1%	4%	1%	4%	7%	9%	70%	1%	292
The fact that the items were mailed to your house	2%	0%	0%	1%	0%	3%	2%	5%	6%	8%	73%	0%	292
The chance to win cash prizes for your household and school	10%	2%	1%	1%	3%	7%	3%	4%	7%	7%	52%	3%	292
Information in the kit about how the items would save energy	5%	0%	2%	2%	1%	8%	5%	11%	11%	11%	44%	1%	292
Information that your child brought home from school	7%	0%	2%	3%	2%	8%	4%	10%	12%	8%	42%	3%	292
Other information or advertisements from Duke Energy, including its website	12%	2%	2%	3%	2%	13%	5%	9%	11%	7%	30%	2%	292

Q42. I've got just a few final questions about other energy saving activities. First, Duke Energy asked us to ask a couple of questions about the Home Energy Reports it sends to some families. These reports provide detailed information on your home's energy usage and compare your home to similar homes of your neighbors.
During the school year, did you receive any Home Energy Reports from Duke Energy?

Response Option	Count	Percent (n=187)
Yes	158	85%
No	22	12%
Don't know	7	4%

Q43. How often do you read those Home Energy Reports?

Response Option	Count	Percent (n=158)
Never	0	0%
Sometimes	37	23%
Always	121	77%
Don't know	0	0%

Q44. The Home Energy Reports provide specific recommendations for how you can save energy in your home. Have you completed any of the energy saving recommendations from the Home Energy Reports? If so, which ones? [MULTIPLE RESPONSE]

Response Option	Count
Nothing	27
Purchased energy saving products for my home and received a Duke Energy rebate	6
Purchased energy saving products for my home but did not receive a Duke Energy rebate	28
Made energy saving modifications to my home (example: installed insulation or windows)	34
Adjusted how or when I use energy in my home	85
Looked for additional information on how to save energy	35
Other (please specify in the box below)	10
Don't know	5

Q45. Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, has your child adopted any **new** behaviors to help save energy in your home? This would only include new energy saving **behaviors** that your child adopted since receiving the kit. [*IF NEEDED: like turning off the lights when room is unoccupied*]

Response Option	Count
Not applicable - no new behaviors	84
Turn off lights when not in a room	209
Turn off electronics when not using them	133
Take shorter showers	89
Other	21
Don't know	11

Q45a. Other…

Response Option	Count
Addressing the television being left on.	1
He was very excited to get the kit and loved installing the new things.	1
I don't know how to answer this, because my child doesn't live with me.	1
I was always taught to be aware of cutting off lights etc. so I've always felt my children to do the same thing.	1
Keep the doors shut	1
No but they were already aware of energy savings	1
No child in family - wife is teacher at the school	1
Reminds others not to waste water when brushing teeth	1
She has increased awareness	1
She's 6.	1
Turn off water when brushing teeth or washing hands	1
Turns water off while brushing teeth	7
Using less water	1
Using the night light	1
When she brushes her teeth, she turns the water off. She opens up the blinds to use sunlight instead of lights.	1

Q45b. [IF Q45 =2-5] Before receiving the kit, was your child already…

Response Option	Count	Percent (n=108)
Turning off lights when not in a room	81	75%
Turning off electronics when not using them	44	41%

Taking shorter showers	23	21%
Other	11	10%

Q46. Since receiving your energy kit from Duke Energy, have you adopted any new behaviors to help save energy in your home? This would only include new energy saving **behaviors** that you have adopted since receiving the kit. [IF NEEDED: like turning off the lights when room is unoccupied]
[MULTIPLE RESPONSE] *[Interviewer: Do not read list. After each response ask, "Anything else?"]*

Response Option	Count
Not applicable - no new behaviors	75
Turning off lights when not in a room	157
Turning off furnace when not home	42
Turning off air conditioning when not home	74
Changed thermostat settings to use less energy	151
Using fans instead of air conditioning	109
Turning off electronics when we are not using them	126
Taking shorter showers	80
Turning water heat thermostat down	40
Other (please specify in the box below)	29
Don't know	7

Q46a. Other…

Response Option	Count
Closing blinds during the day	1
Cut down on use of electronics as well as cut down on how much light we use per room	1
Do not let the water run when cooking	1
Doing laundry less frequently. Using solar lighting for exterior.	1
For the heater, put 1 down, instead of at 68, put at 67.	1
Girls will use natural lights instead of overhead electrical lights	1
I don't know of any, we are pretty efficient anyway.	1
I was already very conscious on saving energy to save money	1
I'm trying to get my trailer under bin to help save energy, especially during the winter to save on heating costs.	1
Installing energy-efficient equipment	1
More aware of electricity usage, bought more LED's	1
No running a half-full washer	1
Opening the blinds to use sunlight.	1

Response Option	Count
Purchasing and installing new energy efficient appliances including an a/c	1
Replacing all light bulbs for LEDs	1
Switched to energy-efficient lightbulbs	1
Trying to be more energy conscience and installed energy efficient windows	1
Turn off water when brushing teeth or cooking	1
Turning off the water when not using it.	1
Turning off water while brushing teeth	1
Turning water on for less time	1
Using electron appliances at night.	1
Using energy-efficient lighting	1
Using open windows instead of air conditioner. Using energy-efficient equipment	1
Using the toilet water gauges to consume less water	1
Watch how much water we use	1
Water conservation	1
We were already doing these things	1

Q46b. [IF Q46 =2-10] Before receiving the kit, were you already…

Response Option	Count	Percent (n=183)
Turning off lights when not in a room	121	66%
Turning off furnace when not home	25	14%
Turning off air conditioning when not home	33	18%
Changing thermostat settings so heating or cooling system uses less energy	75	41%
Using fans instead of air conditioning	60	33%
Turning off electronics when not using them	72	39%
Taking shorter showers	27	15%
Turning water heat thermostat down	13	7%
Other	11	6%

Q47. On a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential,” how much influence did Duke Energy’s kit and materials on saving energy have on your decision to [LIST ALL RESPONSES FROM Q46].

Response Option	Count	Percent (n=252)
0 – Not at all influential	5	2%

1	1	0%
2	0	0%
3	1	0%
4	3	1%
5	14	6%
6	22	9%
7	41	16%
8	49	19%
9	18	7%
10 - Extremely influential	97	38%
Don't know	1	0%

Q47a. Thinking of the near future, are you interested in purchasing any additional products or services to help save energy in your home?

Response Option	Count	Percent (n=334)
Yes	195	58%
No	65	19%
Don't know	74	22%

Q47b. What additional products or services are you interested in purchasing?

Response Option	Count
Energy efficient appliances	76
Efficient heating or cooling equipment	54
Efficient windows	54
Adding insulation	54
Sealing air leaks	92
Sealing or insulating ducts	47
Efficient lighting (LEDs)	134
Energy efficient water heater	60
Internet connected “smart” thermostat	63
Other	18
Don't know	6

Q48. Since receiving your energy kit from Duke Energy, have you purchased and installed any other **products** or made any improvements to your home to help save energy?

Response Option	Count	Percent (n=334)

Yes	92	28%
No	226	68%
Don't know	16	5%

Q49. What **products** have you purchased and installed to help save energy in your home? [MULTIPLE RESPONSE]

Response Option	Count
Bought energy efficient appliances	26
Moved into an ENERGY STAR home	2
Bought efficient heating or cooling equipment	7
Bought efficient windows	4
Added insulation	10
Sealed air leaks	18
Sealed ducts	8
Bought LEDs	59
Bought CFLs	8
Installed an energy efficient water heater	12
None – no other actions taken	0
Other (please specify in the box below)	8
Don’t know	0

Q49a. Other…

Response Option	Count
Added window tinting	1
I purchased more foam that goes behind the light switches.	1
Installed a storm door	1
one energy efficient a/c	1
programmable thermostat	1
Smart thermostat	1
Water leakage tape	1
Water Program.	1

Q50. Did you get a rebate from Duke Energy for any of those products or services? If so, which ones?

Response Option	Count
Bought energy efficient appliances	0
Moved into an ENERGY STAR home	0
Bought efficient heating or cooling equipment	1

Response Option	Count
Bought efficient windows	0
Bought additional insulation	0
Sealed air leaks	1
Sealed ducts	0
Bought LEDs	4
Bought CFLs	1
Installed an energy efficient water heater	0
Other	0
I did not get any Duke Rebates	79
Don't know	7

Q51. On a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential”, how much influence did the Duke Energy schools program have on your decision to…

	0 - Not at all influential	1	2	3	4	5	6	7	8	9	10 - Extremely influential	Don’t Know	Total
Buy energy efficient appliances	8%	0%	0%	4%	8%	12%	0%	15%	15%	8%	31%	0%	26
Move into an ENERGY STAR home	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	50%	2
Buy efficient heating or cooling equipment	29%	0%	0%	0%	0%	0%	0%	29%	0%	0%	29%	14%	7
Buy efficient windows	25%	0%	25%	0%	0%	25%	0%	0%	0%	0%	25%	0%	4
Add insulation	40%	10%	0%	10%	0%	10%	0%	0%	0%	10%	20%	0%	10
Seal air leaks	0%	6%	6%	0%	6%	22%	17%	6%	0%	6%	33%	0%	18
Seal ducts	0%	0%	13%	0%	0%	50%	0%	0%	0%	0%	38%	0%	8
Buy LEDs	10%	2%	0%	3%	0%	12%	14%	10%	10%	7%	29%	2%	59
Buy CFLs	0%	0%	0%	0%	0%	25%	25%	25%	0%	0%	25%	0%	8
Install an energy efficient water heater	8%	0%	8%	0%	0%	8%	8%	0%	0%	0%	50%	17%	12

Other	50%	13%	0%	0%	0%	0%	0%	13%	0%	0%	25%	0%	8

Q52. What kinds of appliance(s) did you buy?

Response Option	Count
Refrigerator	7
Stand-alone Freezer	5
Dishwasher	10
Clothes washer	12
Clothes dryer	9
Oven	8
Microwave	7
Other	1
Don't know	1

Q53. Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=16)
Refrigerator	5	31%
Stand-alone Freezer	3	19%
Dishwasher	8	50%
Clothes washer	10	63%
Clothes dryer	8	50%
Oven	6	38%
Microwave	3	19%
Other	0	0%

Q54. Does the new clothes dryer use natural gas?

Response Option	Count
Yes- it uses natural gas	1
No – does not use natural gas	8
Don't know	0

Q55. What type of heating or cooling equipment did you buy?

Response Option	Count	Percent (n=5)
Central air conditioner	2	40%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	2	40%
Geothermal heat pump	0	0%
Boiler	0	0%

Response Option	Count	Percent (n=5)
Furnace	1	20%
Wifi-enabled thermostat	1	20%
Other (please specify in the box below)	0	0%
Don't know	0	0%

Q55a. Other…

Response Option	Count
Not applicable	0

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

Response Option	Count
Yes	1

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=4)
Central air conditioner	2	50%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	2	50%
Geothermal heat pump	0	0%
Boiler	0	0%
Furnace	1	25%
Wifi-enabled thermostat	0	0%
Other (please specify in the box below)	0	0%
Don't know	0	0%

Q58. How many windows did you install?

Response Option	Count
3	1
6	1
8	1

Q59. Did you add insulation to your attic, walls, or below the floor? [MULTIPLE RESPONSE]

Response Option	Count
Attic	3
Walls	2

Response Option	Count
Below the floor	3
Don’t know	0

Q60a. Approximately what proportion of the attic space did you add insulation?

Response Option	Count
Not applicable	0

Q60b. Approximately what proportion of the wall space did you add insulation?

Response Option	Count
Not applicable	0

Q60c. Approximately what proportion of the below the floor space did you add insulation?

Response Option	Count
Not applicable	0

Q61. Do you know how many of LEDs you installed at your property?

Response Option	Count
Yes	48
Don't know	5

Q61a. How many of LEDs did you install in your property?

Response Option	Count
2	2
3	1
4	1
5	6
6	2
7	1
8	5
9	1
10	3
12	4
15	4
17	2
18	1
20	7

Response Option	Count
25	2
30	1
36	1
38	1
40	2
50	1
Don't know	0

Q62. How many of CFLs did you install in your property?

Response Option	Count
Yes	6
Don't know	2

Q62. Number of CFLS installed…

Response Option	Count
4	2
5	1
8	1
15	1
36	1

Q63. Does the new water heater use natural gas?

Response Option	Count
Yes - it uses natural gas	4
No – does not use natural gas	7
Don't know	0

Q64. Which of the following water heaters did you purchase?

Response Option	Count
A traditional water heater with a large tank that holds the hot water	10
A tankless water heater that provides hot water on demand	0
A solar water heater	0
Other	0
Don't' know	0

Q65. Is the new water heater an ENERGY STAR model?

Response Option	Count
Yes	10
No	0
Don't know	1

Q66. Which of the following types of housing units would you say best describes your home? It is . . .?

Response Option	Count	Percent (n=334)
Single-family detached house	245	73%
Single-family attached home (such as a townhouse or condo)	11	3%
Duplex, triplex or four-plex	6	2%
Apartment or condominium in a building with 5 units or more	36	11%
Manufactured or mobile home	35	10%
Other	0	0%
Don't know	1	0%

Q66. Other…

Response Option	Count
Not applicable	0

Q67. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

Response Option	Count	Percent (n=334)
Less than 500 square feet	8	2%
500 to under 1,000 square feet	37	11%
1,000 to under 1,500 square feet	82	25%
1,500 to under 2,000 square feet	66	20%
2,000 to under 2,500 square feet	49	15%
2,500 to under 3,000 square feet	22	7%
Greater than 3,000 square feet	36	11%
Don't know	34	10%

Q68. Do you or members of your household own your home, or do you rent it?

Response Option	Count	Percent (n=333)

Own / buying	211	63%
Rent / lease	117	35%
Occupy rent-free	5	2%
Don't know	0	0%

Q69. Including yourself, how many people currently live in your home year-round?

Response Option	Count	Percent (n=334)
I live by myself	9	3%
Two people	39	12%
Three people	66	20%
Four people	117	35%
Five people	68	20%
Six people	25	7%
Seven people	7	2%
Eight or more people	2	1%
Don't know	1	0%

Q70. What was your total annual household income for 2017, before taxes?

Response Option	Count	Percent (n=334)
Under $20,000	41	12%
$20,000 to under $30,000	39	12%
$30,000 to under $40,000	35	10%
$40,000 to under $50,000	31	9%
$50,000 to under $60,000	24	7%
$60,000 to under $75,000	21	6%
$75,000 to under $100,000	41	12%
$100,000 to under $150,000	28	8%
$150,000 to under $200,000	10	3%
$200,000 or more	7	2%
Don't know	7	2%
Prefer not to say	50	15%

Q71. What is the highest level of education achieved among those living in your household?

Response Option	Count	Percent (n=334)
Less than high school	7	2%
Some high school	6	2%

Response Option	Count	Percent (n=334)
High school graduate or equivalent (such as GED)	59	18%
Trade or technical school	18	5%
Some college (including Associate degree)	89	27%
College degree (Bachelor's degree)	67	20%
Some graduate school	5	1%
Graduate degree, professional degree	57	17%
Doctorate	11	3%
Don't know	0	0%
Prefer not to say	15	5%

REPORT

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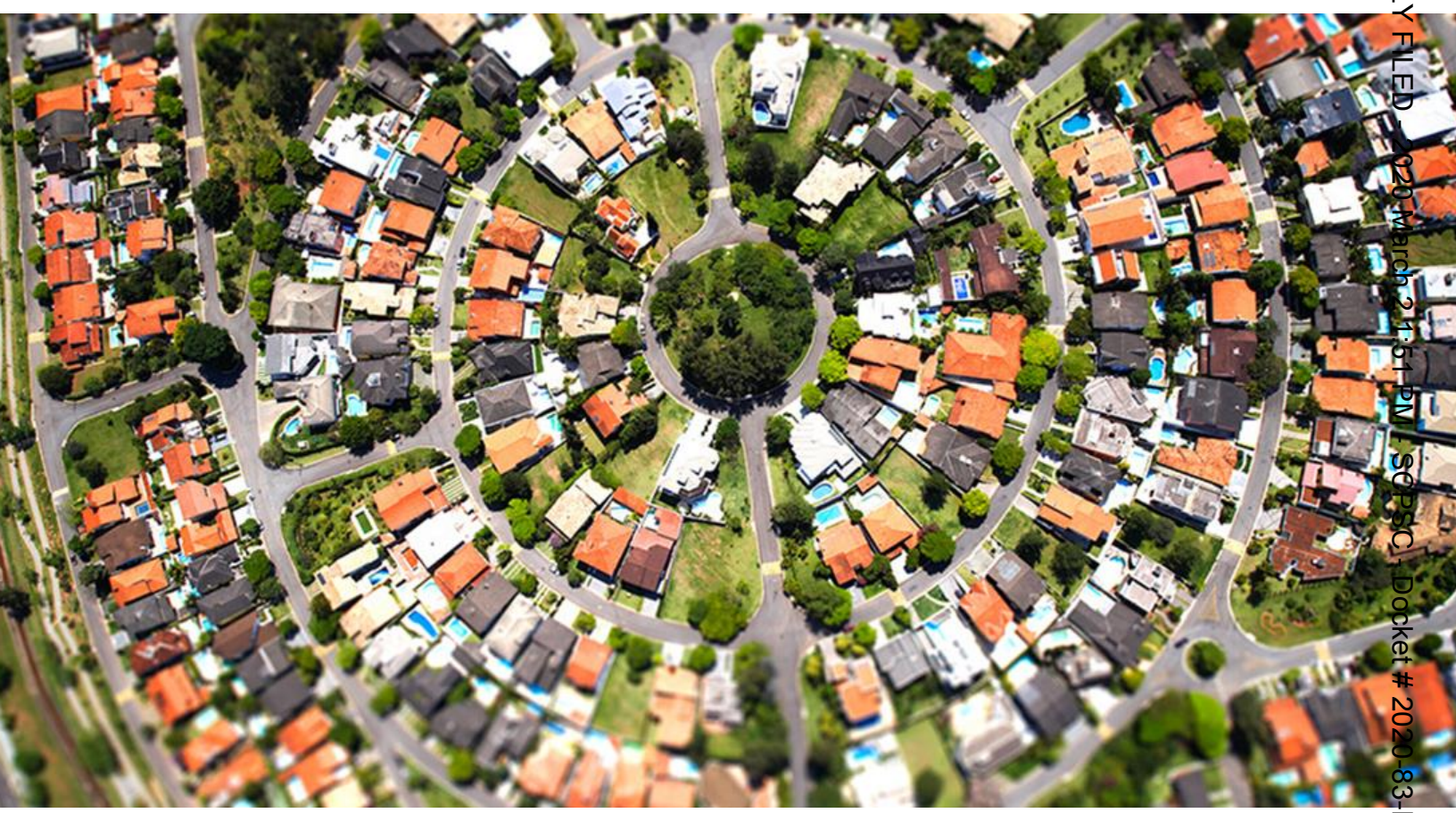

Smart $aver Evaluation Report — May 1, 2016 – April 30, 2017

Submitted to Duke Energy Carolinas in partnership with Research into Action

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1 Executive Summary

1.1 Program Summary

The Smart $aver program offers Duke Energy Carolina ("Duke" or "DEC") existing and new construction residential customers incentives for improving their home's energy efficiency through the installation of energy efficient heating, ventilating, and air conditioning (HVAC) units, smart thermostats, water heating equipment, pool pump, duct sealing and insulation, and attic insulation with air sealing[1]. A tiered incentive structure offers larger rebates for higher efficiency units. Quality install and smart thermostat incentives are not offered as standalone incentives; customers must receive a rebate for a new HVAC system to be eligible for these additional incentives. The program is provided through independent, prequalified contractors who install the eligible energy efficiency measures consistent with the program standards and guidelines, and submit the rebate application documentation on behalf of the customer.

1.2 Evaluation Objectives and Results

This report presents the results and findings of evaluation activities for the Smart $aver program conducted by the evaluation team, collectively Nexant Inc. and our subcontracting partner, Research into Action, in the evaluation period of May 1, 2016 – April 30, 2017.

1.2.1 Impact Evaluation

We conducted this evaluation of the Smart $aver program to estimate gross and net energy, summer demand, and winter demand savings for the entire program and for each major measure type. The evaluation team reviewed available program databases to help inform the design of the evaluation effort and sampling approach. Activities included an in-situ metering study (n=44) to estimate operational hours of air source heat pumps and central air conditioners paired with engineering desk analyses to estimate gross savings for all measures in the program during the evaluation period of May 1, 2016 – April 30, 2017. Net savings are a reflection of the degree to which the gross impacts are a result of the program-specific efforts and incentives. Therefore, we implemented attribution surveys with program participants and contractors to estimate the rates of free ridership and spillover. Program level results for the Smart $aver program are provided in Table 1-1.

[1] HVAC tune-ups were also included in the program offering; however, there was no participation for this service during the evaluation timeframe.

Table 1-1: Program Impact Results

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	9,593,312	83.0%	7,960,401	66.7%	5,308,068
Summer Demand (MW)	2.95	70.5%	2.08		1.38
Winter Demand (MW)	1.30	196.8%	2.50		1.67

In the evaluation period of May 1, 2016 – April 30, 2017, the program provided rebates for 21,817 measures installed in single family homes, resulting in 7,960 MWh in gross verified energy savings. The program primarily incentivized HVAC equipment and related add-on measures (quality installation and smart thermostats), which accounted for 80% of rebated measures and 76% of verified energy savings, as shown in Figure 1-1 and Figure 1-2.

Figure 1-1: Smart $aver Rebated Measures

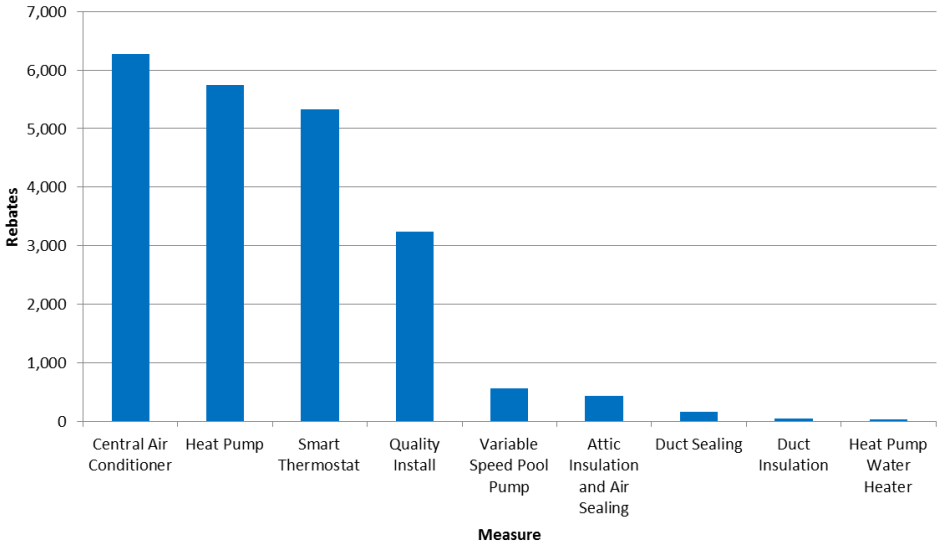


Figure 1-2: Smart $aver Verified Energy Savings

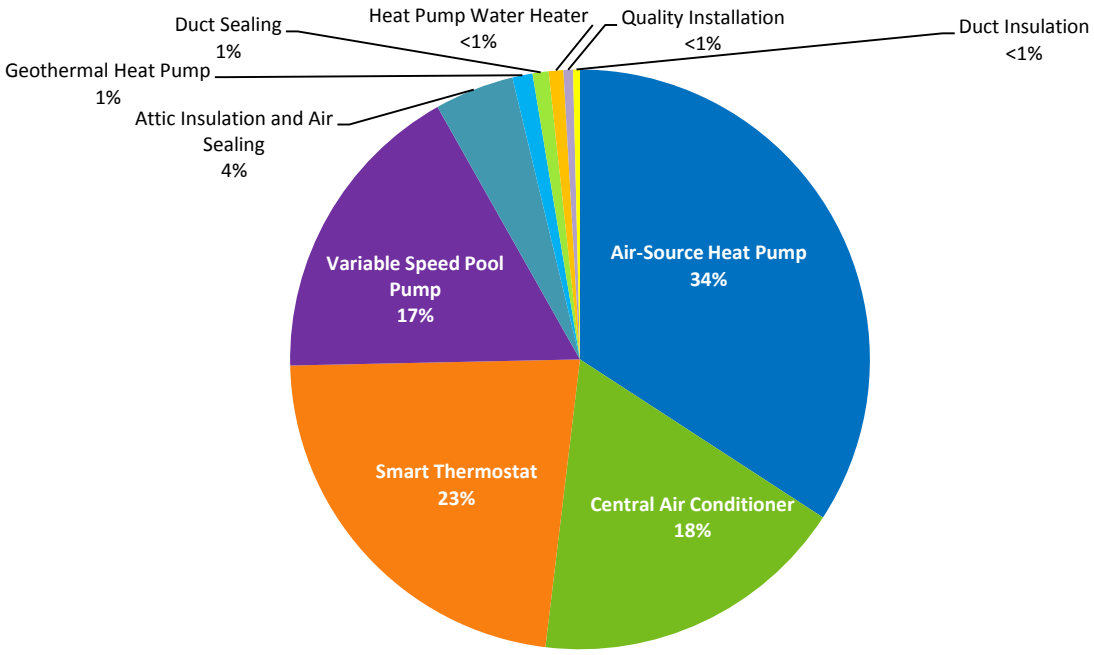


Table 1-2 presents per unit verified gross energy and demand savings with the calculated net-to-gross ratio for each rebated measure.

Table 1-2: Program Verified Impacts by Measure

Measure	Reported Energy Savings per unit (kWh)	Realization Rate	Verified Gross Energy Savings per unit (kWh)	Reported Summer Coincident Demand Savings per unit (kW)	Realization Rate	Verified Gross Summer Coincident Demand per unit (kW)	Reported Winter Coincident Demand Savings per unit (kW)	Realization Rate	Verified Gross Winter Coincident Demand per unit (kW)	Net to Gross Ratio
Central Air Conditioner*	320	70.2%	225	0.195	63.0%	0.123	0.032	516.0%	0.167	
Heat Pump**	416	117.7%	490	0.139	107.5%	0.149	0.122	174.3%	0.213	
Quality Install	376	3.5%	13	0.133	3.8%	0.005	0.084	5.0%	0.004	
Smart Thermostat	377	90.1%	340	0.000	100.0%	0.000	0.000	100.0%	0.000	
Attic Insulation and Air Sealing	1,163	70.9%	824	0.184	120.1%	0.221	0.194	205.8%	0.399	66.7%
Variable Speed Pool Pump	2,342	103.8%	2,430	0..590	89.3%	0.527	0.000	100.0%	0.000	
Heat Pump Water Heater	1,616	100.0%	1,616	0.124	100.0%	0.124	0.000	100.0%	0.000	
Duct Sealing	350	125.1%	438	0.291	55.5%	0.162	0.000	100.0%	0.153	
Duct Insulation	688	92.1%	634	0.573	40.9%	0.234	0.000	100.0%	0.222	

*All values are a weighted average of Tiers 1, 2, and 3. Per unit verified savings for each Tier is provided in Section 3.

** All values are a weighted average of Tiers 1, 2, and 3 with air source heat pumps combined with geothermal heat pumps. The evaluation team assessed savings separately for each technology type and tier and presents these findings in Section 3. References to “heat pump” in subsequent tables and figures in this evaluation report reflect the combined findings for air source and geothermal heat pumps unless otherwise noted.

1.2.2 Process Evaluation

This process evaluation assessed why and how rebated energy saving measures were implemented through Smart $aver and identified ways to improve the program design and implementation. To answer these research questions, the evaluation team interviewed program and implementer staff (n=2) and "high volume" trade allies (n=5), and surveyed stratified random samples of trade allies (n=58) and participants (n=73).[1]

Program Successes

The DEC Smart $aver Program found success in the following areas.

Overall, participants are highly satisfied with Smart $aver. Participants were especially satisfied with their contractors, their upgrade project, and the program overall.

Smart $aver influences energy efficiency contracting services in DEC service territory. Trade allies reported that participating in Smart $aver influenced them to recommend and implement qualifying measures and has increased their knowledge of energy efficient technologies.

Trade allies are Smart $aver's most successful marketing channel. Participant surveys demonstrated that trade allies are the primary source of program awareness (Table 1-3) and are the most influential factor on the customer's decision to implement rebated measures.

Table 1-3: Source of Program Awareness (Multiple Responses Allowed; n=73)

Source of Program Awareness	Percent
Trade ally	77%
Online	11%
Mailer	8%
Other	3%
Don't know	6%

Program Challenges

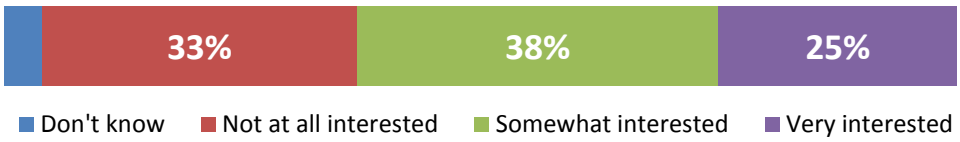
The following concerns were highlighted by trade allies and participants.

Smart $aver is not a strong gateway program. About one-third (29%) of participants reported awareness of other DEC programs, and 41% of those participated (12% of total sample). Since receiving Smart Saver rebates, 30% of participants reported purchasing other products or services to help save energy in their homes. However, very little of this resulted in attributable spillover savings as most (16 of 22) said Smart $aver had no influence on their subsequent energy upgrades.

[1] High volume trade allies are companies in the top 20% of trade allies in terms of number of rebated measures, for a given campaign, in 2016.

Trade allies could benefit from additional sales training. Most trade allies expressed interest in training to help them sell qualified measures (Figure 1-3).

Figure 1-3: Trade Ally Interest in Sales Training (n=58)



The transition to the online portal has been challenging for trade allies. The portal was the biggest sticking point for trade allies, with 71% reporting problems or frustrations with the new rebate application process. Trade allies most commonly reported the following issues:

- data entry and form upload problems (which causes them to resubmit forms)
- reasons for rebate rejections are vague or unknown
- the application process takes too much time
- resolving application issues tend to be an onerous task

However, nearly three-fourths of trade allies said portal issues have gotten at least somewhat better over time.

Quality installation has caused dissatisfaction among many trade allies. While most trade allies said they were already doing all of the techniques on the quality install checklist, only one mentioned all of the primary components of the checklist when asked to list the specific techniques. When asked if they had any suggestions for improving quality install, many trade allies noted their frustration with and criticism of the measure. Trade allies were most dissatisfied with the cumbersome process of the quality installation checklist and many either suggested eliminating the requirement or compensating the trade ally for their time completing the quality installation.

1.3 Evaluation Conclusions and Recommendations

Based on evaluation findings, the evaluation team concluded the following and provides several recommendations for program improvement.

Conclusion 1: Trade allies are the driving force of the program, but there may be opportunities to improve their program experience and effectiveness. Trade allies are the primary mechanism for bringing participants into the program, as they often upsell energy efficient systems to customers who have no prior awareness of the program during a time of immediate heating or cooling needs. However, trade ally satisfaction with certain program elements is relatively low, particularly: the application process and portal, program training, and the quality installation process and requirements.

- **Recommendation: Look for ways to increase trade ally satisfaction and rebate volumes.** Trade allies are vital to the program's success, DEC should work with Blackhawk Engagement Solutions, the program implementer, to improve the trade ally experience and look for ways to increase trade ally effectiveness in the field.
- Potential strategies for increasing trade ally effectiveness (and simultaneously increasing trade ally satisfaction):
  - Provide marketing materials to trade allies, such as co-op marketing
  - Attempt to increase trade ally participation in training events. Potential strategies:
    - Align training offerings with trade ally content requests, particularly: sales, quality install, portal/application process, and program changes
    - Ensure training sessions occur during convenient periods during the year (i.e., non-peak seasons) and convenient times (breakfast meetings can be particularly successful).
- Potential strategies for improving Trade Ally (TA) satisfaction:
  - Continue improving portal system and simplifying the application process
  - Consider splitting incentives with TAs to compensate TAs for their time spent on Duke Energy processes. Shifting a small portion of the incentive to the trade ally is unlikely to negatively impact participation levels, as participants were only marginally influenced by the rebate and were instead mainly influenced by their contractor's recommendation (a finding which underscores the need to retain a strong trade ally network).

Conclusion 2: Approximately 60% of sampled quality install sheets included issues. Trade allies complete quality install sheets detailing system measurements taken while on site. Upon review of a sample of quality install sheets, the evaluation team found several issues including:

- Math errors
- Calculated capacities below program requirement
- Rule of thumb CFM estimates instead of actual measurements
- Testing in sub-optimal conditions

These issues compromise the validity of the impact of quality installation and therefore the associated energy and demand savings cannot be verified.

- **Recommendations:**
  - Establish additional internal QA/QC processes when reviewing submitted quality install sheets.
  - Work with trade allies to better understand issues encountered with the quality install sheets and to improve quality install reporting.

Conclusion 3: The quality installation measure may have experienced some growing pains in its infancy. Many trade allies expressed frustration with the 'complex and time

consuming' quality install form, especially since they receive no compensation for completing it. These concerns may have limited the initial growth of the new measure:

- Tier 1 (which requires QI) was the least installed HVAC tier, amounting to about one-tenth of all HVAC units in the program.
- Less than one-third of Tier 2 and Tier 3 HVAC units received a QI rebate.
    - **Recommendation: As DEC matures the quality installation measure, look for ways to retain, expand, and improve trade ally quality install practices.**
    - Potential strategies for retaining and expanding trade ally quality installation practices:
        - Shift the quality install rebate to trade allies: trade ally dissatisfaction with the process may be mitigated by compensation.
        - Hold a round table meeting with trade allies to collaborate on a revised quality install process that better serves the needs of both parties: for DEC to generate cost-effective savings from the measure, the process must be minimally burdensome for trade allies so that they actively and accurately complete it

Conclusion 4: New HVAC rebates and requirements are generating additional energy savings that would not have occurred naturally. The new HVAC program components have resulted in increased trade ally sales of high SEER HVAC units and smart thermostats. Although comparatively less successful, quality installation rebates and requirements have encouraged a minority of trade allies to adopt new quality install techniques.

- **Recommendation 1:** Continue offering the new incentives:
    - tiered HVAC incentives
    - smart thermostats incentives
    - QI incentives (however, shift the rebate to trade allies)
- **Recommendation 2:** Continue looking for new program offerings that could generate additional savings.

2 Introduction and Program Description

2.1 Program Description

The Smart $aver program offers Duke Energy Carolinas ("Duke" or "DEC") existing and new construction residential customers incentives for improving their home's energy efficiency through the installation of energy efficient heating, ventilating, and air conditioning (HVAC) units, smart thermostats, water heating equipment, pool pump, duct sealing and insulation, and attic insulation with air sealing[1]. A tiered incentive structure offers larger rebates for higher efficiency units. Quality install and smart thermostat incentives are not offered as standalone incentives; customers must receive a rebate for a new HVAC system to be eligible for these additional incentives.

The program is provided through independent prequalified contractors – called "trade allies" – who install the eligible energy efficiency measures consistent with the program standards and guidelines, and submit the rebate application documentation on behalf of the customer. Trade allies receive no monetary incentives for measures they install in existing buildings, but builders are eligible to receive rebates for qualified HVAC equipment installed in residential new construction projects.

2.1.1 Energy Efficiency Measures

Energy efficiency measures included in the Smart $aver program are summarized in Table 2-1.

[1] HVAC tune-ups were also included in the program offering; however, there was no participation for this service during the evaluation timeframe.

Table 2-1: Smart $aver Measures and Incentives

Measures		Rebate Amount	Details
Central Air Conditioner		Tier 1: $250 Tier 2: $250 Tier 3: $300	Tier 1: 14 SEER, ECM fan on indoor unit, quality installation required Tier 2: 15 and 16 SEER, with ECM Tier 3: 17 SEER or greater, with ECM
Heat Pump*	*Air Source*	Tier 1: $250 Tier 2: $250 Tier 3: $300	Tier 1: 14 SEER, ECM fan on indoor unit, quality installation required Tier 2: 15 and 16 SEER, with ECM Tier 3: 17 SEER or greater, with ECM
	Geothermal	Tier 3: $300	Tier 3: 19 SEER or greater, with ECM
Smart Thermostat		$100	Add-on incentive for HVAC participants
Quality Installation		$60	Required on Tier 1 HVAC (no add-on incentive provided), add-on incentive for Tier 2 and Tier 3 HVAC participants
Attic Insulation & Air Seal		$250	R-19 or below to R-30 or greater; decrease home air leakage by 5% or more
Variable Speed Pool Pump		$300	Equipment must be an ENERGY STAR® qualified variable-speed pool pump for use with main filtration of in-ground residential swimming pool; applications for motor replacements only are not eligible.
Heat Pump Water Heater		$350	ENERGY STAR® qualified units. Must have an EF ≥ 2
Duct Sealing		$100/duct system	Decrease air duct leakage by 12% or more
Duct insulation*		$75/duct system	For unconditioned attic: R-4.2 to R-19 or greater; for unconditioned crawl space or basement: R-0 to R-6 or greater

*The Smart$aver program filing stipulates heat pumps as a certified measure. However, because the program rebated both air source and geothermal heat pumps during the evaluation period, the evaluation team assessed savings separately for each technology type. References to “heat pump” in subsequent tables and figures in this evaluation report reflect the combined findings for air source and geothermal heat pumps unless otherwise noted.

2.2 Program Implementation

The Smart $aver program is chiefly implemented by Blackhawk Engagement Solutions (BES). BES manages the trade ally registration process, incentive application submission and fulfillment, the trade ally online portal, and the program call center. As part of the prequalification process, all contractors who wish to participate are required to enter into a Letter of Agreement or Prequalified Contractor Participation Agreement for participation in the program. Contractors who meet program requirements are included in a prequalified contractor listing on the program website. Prequalified contractors have permission to promote Smart $aver program measures and identify themselves as a program contractor.

Upon selection by the customer, contractors will complete the requested installation in accordance with all Smart $aver Program standards and guidelines, and all applicable building codes. Contractors use the online portal to submit incentive applications. Paper format incentive applications are also accepted, but discouraged. Prequalified contractors provide itemized invoices with sufficient detail describing what was installed.

Upon receipt of the application, BES verifies that the application is complete and accurate, and will follow up with customers or contractors to resolve any discrepancies. DEC staff conduct quality control inspections on a small share of installed measures.[2] Inspections are to be shared across all contractors, with new contractors and those who have had quality issues being inspected at a higher rate. Upon approval of applications, incentives are issued to participating customers (and, when applicable, builders or trade allies) for the incentive value.

DEC provides marketing through several channels, including: direct mail campaigns, utility website, participating contractor outreach and advertising, and contractor associations. DEC also performs trade ally outreach and training services.

Eligibility

DEC residential account holders residing in DEC electric service territory are eligible for the Smart $aver rebates. All customers participating in the program must be on a DEC residential electric rate. The program is open to existing residential electric service customers living in single-family homes, condominiums, mobile homes, townhomes and duplexes. Builders may also apply for HVAC rebates for their residential new construction projects.

2.3 Key Research Objectives

Over-arching project goals will follow the definition of impact evaluation established in the "Model Energy-Efficiency Program Impact Evaluation Guide – A Resource of the National Action Plan for Energy Efficiency," November 2007:

[2] DEC staff inspects the first five projects completed by new trade allies. Further, DEC staff randomly inspects 10% of projects for each measure category.

"Evaluation is the process of determining and documenting the results, benefits, and lessons learned from an energy-efficiency program. Evaluation results can be used in planning future programs and determining the value and potential of a portfolio of energy-efficiency programs in an integrated resource planning process. It can also be used in retrospectively determining the performance (and resulting payments, incentives, or penalties) of contractors and administrators responsible for implementing efficiency programs."

Evaluation has two key objectives:

1) To document and measure the effects of a program and determine whether it met its goals with respect to being a reliable energy resource.
2) To help understand why those effects occurred and identify ways to improve.

2.3.1 Impact

Over-arching project impact evaluation processes followed standard industry protocols and definitions, where applicable, and include the Department of Energy Uniform Methods Protocol, as an example. As part of evaluation planning, the evaluation team outlined the following activities for this program evaluation:

- Quantify accurate and supportable energy (kWh) and demand (kW) savings for energy efficient measures and equipment implemented in participants' homes;
- Assess the rate of free riders from customer and contractor perspective and determine spillover effects;
- Benchmark verified measure level energy impacts to applicable technical reference manuals (TRMs) and other Duke-similar programs in other jurisdictions;
- Consider and verify that measure installation vintage aligns with measure baseline definitions, i.e. early replacement, burnout on failure, etc.; and,
- To the extent possible for the purposes of program planning, the evaluation team will seek to provide estimated per-unit savings by measure.

2.3.2 Process

The process evaluation was designed to support organizational learning and program adaptation. To this end, the evaluation team sought to research several elements of the program delivery and customer experience as outlined below:

- **Awareness and Engagement:** How aware are customers of the Smart $aver program? What are the primary sources of information (e.g., trade allies, program website, bill inserts) that customers use to learn more about the program? How do customers typically learn about energy efficient technologies? How are trade allies engaged in the Smart $aver program, and what is the most effective engagement source (e.g., implementer, program website). Is there a need to conduct any additional marketing of the program and/or provide marketing support to trade allies?

- **Program Satisfaction:** How satisfied are participants with the overall program experience, their contractor and the quality of the installation, incentive turnaround, energy savings after the work was performed, and Duke Energy? How satisfied are trade allies with the program?
- **Program Influence:** Does the program influence participants to engage in other Duke Energy energy-efficiency programs? Does the program increase contractor's knowledge of energy-efficient technologies? Does the program increase how often participating contractors promote energy-efficient equipment and services to their customers?
- **Challenges and opportunities for improvement:** Are there any inefficiencies or challenges with the application, incentive turnaround, or trade allies? What training opportunities could be offered to trade allies to help them more effectively sell rebated equipment? How engaged are trade allies in using the implementer web portal or other program resources?
- **Participant characteristics and potential:** What are the demographic characteristics of those participating in the program? Are there segments of the population that are not participating but have high participation potential and should be reached?
- **Code Changes:** New Seasonal Energy Efficiency Ratio (SEER) standards were enforced for heat pumps and air conditioners manufactured or distributed on or after January 1, 2015. What are trade ally perspectives on how this change will affect the market and the program?

2.4 Evaluation Overview

The evaluation team divided the approach into key tasks to meet the goals outlined:

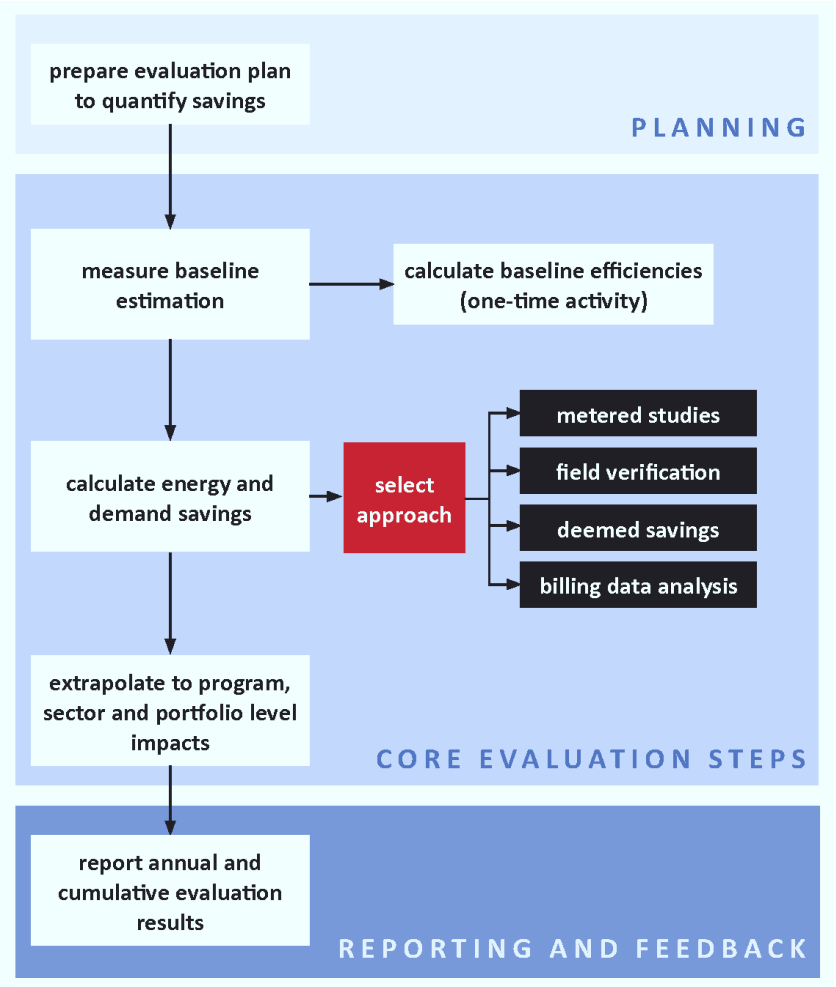
- **Task 1 –** Develop and manage evaluation plan to describe the processes that will be followed to complete the evaluation tasks outlined in this project;
- **Task 2 –** Conduct a process review to determine how successfully the program is being delivered to market and identify opportunities for improvement;
- **Task 3 –** Verify gross and net energy and peak demand savings resulting from the Smart $aver program through on-site measurements and verification activities of a sample of program participants and projects.

2.4.1 Impact Evaluation

The primary determinants of impact evaluation costs are the sample size and the level of rigor employed in collecting the data used in the impact analysis. The accuracy of the study findings is in turn dependent on these parameters. Techniques that we used to conduct our evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, include on-site inspections and measurements, telephone surveys, database review, best practice review, and interviews with implementation staff, trade allies, and program participants.

Figure 2-1 demonstrates the principle evaluation steps organized through planning, core evaluation activities, and final reporting.

Figure 2-1: Impact Evaluation Process



The evaluation team targeted sample sizes for on-site activities based upon the evaluation team's understanding of the expected significance (or magnitude) of expected participation, the level of certainty of savings, and the variety of measures.

The evaluation generally comprised the following steps, which are described in further detail throughout this report:

- **Design the Sample for Measurement and Verification (M&V):** The review, measurement, and verification of all implemented projects is not plausible or cost-effective given the size of this program. Consequently, a sample of projects was established for M&V. In order to provide the most cost-effective sample, the evaluation team employed a Value of Information (VOI) approach. VOI is used to balance cost and rigor and follows a process to allocate the bulk of the evaluation funds to programs and projects with high impact and high uncertainty.
- **Develop Measure-Specific M&V Plans**: Upon review of the program documents, a unique M&V plan was developed for each program and measure, including a metering protocol, as applicable. M&V methods were developed with adherence to

the International Performance Measurement and Verification Protocol (IPMVP) and other well-established engineering analysis procedures.

- **Participant Surveys and On-site Inspections:** The database review provided the necessary information to design a sample of projects to review. All sampled projects received a telephone survey with the participant. Additionally, a portion of the sampled projects received on-site measurement and verification to further detail the information obtained during the database review and ultimately used to calculate energy savings. Table 2-2, in Section 2.4.3 below summarizes the number of surveys and on-site inspections completed. The samples were drawn to meet a 90% confidence and 10% precision at the program level.
- **Calculate Impacts and Analyze Load Shapes:** Data collected via the on-site visits, database reviews and telephone surveys enabled the evaluation team to calculate gross verified energy and demand savings for each project or measure. Hourly load shapes are important in calculating system on-peak demand savings, especially when the measures installed have daily and seasonal variations in the operating schedule.
- **Estimate Net Savings**: Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and incentives. The evaluation team estimated free-ridership and spillover for each project in the impact sample utilizing self-report methods through surveys with program participants. The ratio of net verified savings to gross verified savings is the net-to-gross ratio as an applied scaling factor to the reported savings.

2.4.2 Process Evaluation

Process evaluation tells the qualitative story behind the quantitative impact evaluation by understanding the program in its unique context. The goal of process evaluation is to perform a systematic assessment of an energy efficiency program by generating feedback that achieves the following outcomes:

- Document program operations
- Recommend improvements to increase the program's efficiency and effectiveness
- Assess stakeholder satisfaction

These outcomes can inform program planning, existing program implementation, or efforts to redesign a program. Process evaluations typically cover all aspects of a program including its design, implementation, marketing and outreach, data tracking, quality assurance, customer and stakeholder feedback, and market conditions. By evaluating the broad context in which a program operates, evaluators can recommend realistic improvements. Evaluators typically examine program aspects through the following mechanisms:

- Database and document review
- Interviews with program staff and key stakeholders, such as trade allies
- Surveys with customers

- Benchmarking research
- Marketing review

Information gathered from participating customers and trade allies through process evaluation activities can be measured and analyzed to form the basis of a NTG ratio. For example, participant surveys used to assess participant satisfaction also provide opportunity to ask participants about their motivations for participating and the influence of the program on their decisions, both of which are key components of a free ridership calculation. Similarly, the participant surveys are used to assess whether participants installed additional energy savings measures, which could be attributed to spillover.

2.4.3 Summary of Activities

Techniques we utilized to conduct the evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, included field inspection and metering, telephone surveys with program participants, program database reviews and in-depth interviews (IDI) with utility staff, implementer, and trade allies. Table 2-2 provides a summary of the activities Nexant conducted as part of the Smart $aver program process and impact evaluation for the period of May 1, 2016 – April 30, 2017.

Table 2-2: Summary of Evaluation Activities

Target Group	Population	Sample	Method
Central Air Conditioner and Air Source Heat Pump	11,976	46	Field inspection and metering
Participants (rebated measures)	9,841	73	Telephone Survey
Duke Energy Program Staff	N/A	1	In-depth interview (IDI)
Implementer Staff	N/A	1	IDI
Most Active Trade Allies	~20	5	IDI
Trade Allies	624	58	Telephone survey

2.5 Sample and Estimation

The gross and net verified energy and demand savings estimates presented for the majority of the Smart $aver program participation were generally determined through the observation of key measure parameters among a sample of program participants. A census evaluation would involve surveying, measuring, or otherwise evaluating the entire population of projects within a population. Although a census approach would eliminate the sampling uncertainty for an entire program, the reality is that M&V takes many resources both on the part of the evaluation team and the program participants who agree to be surveyed or have site inspections conducted in their home. When a sample of projects is selected and analyzed, the sample statistics can be extrapolated to provide a reasonable estimate of the population parameters. Therefore, when used effectively, sampling can improve the overall quality of an evaluation study but at a lower

cost. By limiting resource-intensive data collection and analysis to a random sample of all projects, more attention can be devoted to each project surveyed.

The nuances and tradeoffs considered by the evaluation team when developing sampling approaches varied by measure across the program and are discussed in more detail in Section 3 and Section 4. However, several common objectives were shared across measures and research objectives. The most important sampling objective was representativeness – that is that the projects selected in the evaluation were representative of the population they were selected from and would produce unbiased estimates of population parameters. A second key sampling objective was to consider the value of information being collected and align sample allocations accordingly. This effort generally involves considering the size (contribution to program savings) and uncertainty associated with the measure being studied and making a determination about the appropriate level of evaluation resources to allocate.

The evaluation team relied primarily on mean-per-unit estimation for the Smart $aver program and separated the program population into a series of homogenous measure categories. This approach works well for residential programs that include a large number of rebates for similar equipment types where the evaluation objective is to determine an average kWh savings per rebated measure. With mean-per-unit estimation, the average kWh savings and NTG ratio observed within the sample is applied to all projects in the population. For several measures the characteristics observed within the evaluation sample were supplemented with parameter values that were available for all members of the population in the program database. For example, the program database stores the capacity (BTU/hour) for every rebated air source heat pump so the evaluation team used the population mean capacity when calculating average per-unit energy savings rather than the sample mean.

2.5.1 Stratification

The evaluation team used sample stratification for the gross impact, net impact, and process evaluation sampling. Stratification is a departure from simple random sampling, where each sampling unit (customer/project/rebate/measure) has an identical likelihood of being selected in the sample. Stratified random sampling refers to the designation of two or more sub-groups (strata) from within a program population prior to the selection process. The evaluation team felt that stratification was advantageous and utilized this approach in the sample design for a variety of reasons across the program, including:

- Increased precision of the within-stratum variability was expected to be small compared to the variability of the population as a whole. Stratification in this case allows for increased precision or smaller total sample sizes, which lowered evaluation costs.
- Ensured a minimum number of units within a particular stratum will be verified. For example, Smart $aver participation in the defined evaluation period was dominated by air source heat pump and central air conditioner installations. A simple random sample would have likely returned zero heat pump water heaters or pool pump

samples. The evaluation team felt it was important to develop primary research results for less common offerings; therefore, separate strata were created.

- Allowed for a value-of-information approach to be implemented through which the largest measures are sampled at a much higher rate than smaller projects by creating size-based strata.

2.5.2 Presentation of Uncertainty

There is an inherent risk, or uncertainty, that accompanies sampling, because the projects selected in the evaluation sample may not be representative of the program population as a whole with respect to the parameters of interest. As the proportion of projects in the program population that are sampled increases, the amount of sampling uncertainty in the findings decreases. The amount of variability in the sample also affects the amount of uncertainty introduced by sampling. A small sample drawn from a homogeneous population will provide a more reliable estimate of the true population characteristics than a small sample drawn from a heterogeneous population. Variability is expressed using the coefficient of variation (C_v) for programs that use simple random sampling, and an error ratio for programs that use ratio estimation. The C_v of a population is equal to the standard deviation (σ) divided by the mean (μ) as shown in Equation 2-1.

Equation 2-1: Coefficient of Variation

$$C_v = \frac{\sigma}{\mu}$$

Equation 2-2 shows the formula used to calculate the required sample size for each evaluation sample, based on the desired level of confidence and precision. Notice that the C_v term is in the numerator, so the required sample size will increase as the level of variability increases. For programs that rely on ratio estimation error ratio replaces the C_v term in Equation 2-2. Results of the previous Duke Energy evaluations and Nexant evaluations from other jurisdictions were the primary source of error ratio and C_v assumptions for the 2016 Smart $aver evaluation.

Equation 2-2: Required Sample Size

$$n_0 = \left(\frac{z * C_v}{D}\right)^2$$

Where:

n_0 = *The required sample size before adjusting for the size of the population*

Z = *A constant based on the desired level of confidence (equal to 1.645 for 90% confidence two-tailed test)*

C_v = *Coefficient of variation (error ratio for ratio estimation)*

D = *Desired relative precision*

The sample size formula shown in Equation 2-2 assumes that the population of the program is infinite and that the sample being drawn is reasonably large. In practice, this assumption is not always met. For sampling purposes, any population greater than approximately 7,000 may be considered infinite for the purposes of sampling. For smaller, or finite, populations, the use of a finite population correction factor (FPC) is warranted. This adjustment accounts for the extra precision that is gained when the sampled projects make up more than about 5% of the program savings. Multiplying the results of Equation 2-2 by the FPC formula shown in Equation 2-3 will produce the required sample size for a finite population.

Equation 2-3: Finite Population Correction Factor

$$\boldsymbol{fpc = \sqrt{\frac{N - n_0}{N - 1}}}$$

Where:

N = *Size of the population*

n_0 = *The required sample size before adjusting for the size of the population*

The required sample size (*n*) after adjusting for the size of the population is given by Equation 2-4.

Equation 2-4: Application of the Finite Population Correction Factor

$$\boldsymbol{n = n_0 * fpc}$$

Verified savings estimates always represent the point estimate of total savings, or the midpoint of the confidence interval around the verified savings estimate for the program. Equation 2-5 shows the formula used to calculate the margin of error for a parameter estimate.

Equation 2-5: Error Bound of the Savings Estimate

$$Error\ Bound = se * (z - statistic)$$

Where:

se = *The standard error of the population parameter of interest (proportion of customers installing a measure, realization rate, total energy savings, etc.) This formula will differ according to the sampling technique utilized.*

$z - statistic$ = *Calculated based on the desired confidence level and the standard normal distribution.*

The 90% confidence level is a widely accepted industry standard for reporting program-level uncertainty in evaluation findings. The z-statistic associated with 90% confidence is 1.645.

When evaluators or regulators use the term “90/10”, the 10 refers to the relative precision of the estimate. The formula for relative precision shown in Equation 2-6:

Equation 2-6: Relative Precision of the Savings Estimate

$$Relative\ Precision_{Verified\ Savings} = \frac{Error\ Bound_{(kWh\ or\ kW)}}{Verified\ Impact_{(kWh\ or\ kW)}}$$

An important attribute of relative precision to consider when reviewing achieved precision values is that it is “relative” to the impact estimate. Therefore measures with low realization rates are likely to have larger relative precision values because the error bound (in kWh or kW) is being divided by a smaller number. This means two measures with exactly the same reported savings and sampling error in absolute terms, will have very different relative precision values, as shown in Table 2-3.

Table 2-3: Relative Precision Example

Program	Reported kWh	Realization Rate	Error Bound (kWh)	Verified kWh	Relative Precision (90%)
Measure #1	4,000,000	0.5	400,000	2,000,000	± 20%
Measure #2	4,000,000	1.0	400,000	4,000,000	± 10%

To calculate a Smart $aver program-level savings estimate requires summation of the verified savings estimates from several strata. In order to calculate the relative precision for these program-level savings estimates, the Evaluation Team used Equation 2-7 to estimate the error bound for the program as a whole from the stratum-level error bounds.

Equation 2-7: Combining Error Bounds across Strata

$$Error\ Bound_{Program} = \sqrt{Error\ Bound^2_{Stratum1} + Error\ Bound^2_{Stratum2} + Error\ Bound^2_{Stratum3}}$$

Using this methodology, the evaluation team developed verified savings estimates for the program and an error bound for that estimate. The relative precision of the verified savings for the program is then calculated by dividing the error bound by the verified savings estimate.

3 Impact Evaluation

3.1 Methodology

An impact evaluation was performed to evaluate energy and demand savings attributable to the Smart $aver program. The evaluation was divided into two research areas; determining gross and net savings (or impacts). Gross impacts are energy and demand savings found at a participant's home that are the direct result of a measure installed and rebated through the program. Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and funds. The evaluation team verified energy and demand savings attributable to the Smart $aver program by conducting the following impact evaluation activities:

- Database and ex ante savings review.
- Sampling of participating measures.
- Performing on-site metering for air source heat pump and central air conditioner replacements to estimate hours of operation and associated amperage.
- Estimating gross verified savings using data collected in previous tasks.
- Comparing the DEC ex ante savings to gross-verified savings to determine program- and measure-level realization rates.
- Applying attribution surveys to estimate net-to-gross ratios and net-verified savings at the program level.

The impact evaluation activities result in the calculation of an adjustment factor called a realization rate, which is applied to the reported savings documented in the program tracking records. The realization rate is the ratio of the savings determined from the site inspections, M&V activities, or engineering calculations to the program-reported savings. The adjusted savings obtained by multiplying the realization rate by the program-reported savings are termed the verified gross savings and they reflect the direct energy and demand impact of the program's operations.

3.2 Database and Ex Ante Review

Review of the program database provided details that informed all evaluation activities. The scope of the evaluation was oriented based on information referenced from the program database, including; the rebate count for each measure and measure specific installation details. These data were considered when designing approaches and methods to evaluate the program. For example, the database included baseline efficiencies for existing equipment; however, it did not include details regarding the working condition of that equipment. Therefore, the participant survey included questions to understand the condition of participants' original equipment to inform the type of baseline the evaluation should use when calculating savings (i.e., early replacement or burnout).

The evaluation team also conducted a review of ex ante savings values, i.e., program reported savings, for each measure rebated during the evaluation period. This review consisted of benchmarking the ex ante value against other evaluation results of similar programs from nearby Duke Energy jurisdictions as well as against regional technical reference manuals (TRMs). This review allowed the evaluation team to understand if the program's assumed savings values are or are not in line with expectations. The details of the ex ante review are referenced in Table 3-1.

This benchmarking exercise exposed concerns regarding the program's two most active measures: central air conditioners and air source heat pumps. Both of these measures had significantly larger ex ante values for Tier 1 efficiencies when compared to each TRM as well as a recently completed evaluation for a very similar HVAC program in Duke Energy Progress. Tiers 2 and 3 ex ante values for central air conditioners and air source heat pumps, however, were more aligned with the benchmarked values. Due to this variation, additional emphasis was placed these measures during the evaluation.

Table 3-1: Comparison of DEC Smart $aver Energy Savings Estimates to Peer Group Estimates

Measure	DEC Smart $aver 2016 PY Deemed Savings (kWh)	DEP HEIP 2014 PY Evaluation (kWh)	Georgia Power 2014 Evaluation (kWh)[1]	Ohio 2010 TRM (kWh)[2]	Texas 2017 TRM (kWh)[3]	Mid-Atlantic 2016 TRM (kWh)[4]
Attic Insulation & Air Seal	1,163	364	461	100/2,183*	443/2,045*	187/2,086*
Central Air Conditioner	-	299	525	-	-	-
Tier 1	464[5]	n/a	-	181	156	195
Tier 2	283	n/a	-	328	299	304
Tier 3	404	n/a	-	485	894	444
Air Source Heat Pump	-	865	875	-	-	-
Tier 1	702[5]	n/a	-	279	394	210
Tier 2	350	n/a	-	764	686	553
Tier 3	496	n/a	-	1,497	1,757	1,074
Ground Source Heat Pump	n/a	1,725	2,744	2,744	1,836	2,698
Smart Thermostat	377	n/a	n/a	n/a	n/a	n/a
Quality Installation	376	n/a	n/a	n/a	n/a	n/a
Variable Speed Pool Pump	2,342	n/a	n/a	1,170	n/a	594
Duct Sealing	350	336	353	68	205/383*	248/592*
Heat Pump Water Heater	1,616	1,978	1,477	2,076/1,297*	1,737	1,511/1,362*

* Values separated by a slash show the estimated savings for homes with AC and gas heating and those with Air Source Heat Pumps. Central AC homes are shown first with Heat Pump homes shown second

[1] July 2015 Evaluation Report Public Filing

[2] State of Ohio Energy Efficiency Technical Reference Manual. August 6, 2010; Dayton location chosen for weather dependent measures

[3] Texas Technical Reference Manual, version 4.0, Volume 2 Residential Measures. November 1, 2016. Amarillo location chosen for weather dependent measures

[4] Mid-Atlantic Technical Reference Manual, version 6.0, May 2016. Washington DC location chosen for weather dependent measures

[5] Tier 1 Central Air Conditioner and Air Source Heat Pump Savings include savings from mandatory Quality Installation and ECM

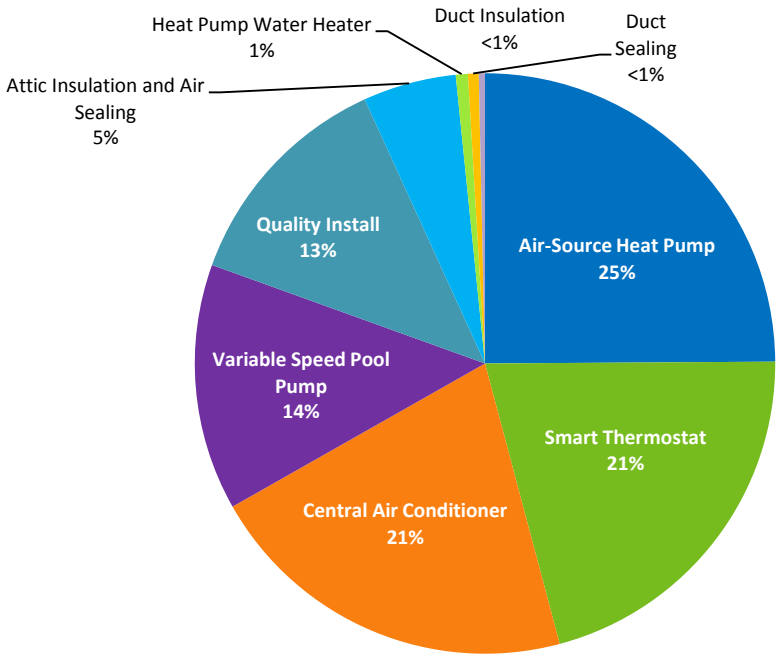
3.3 Sampling Plan and Achievement

To provide representative results, and meet program evaluation goals, a sampling plan was created to guide all evaluation activity. A random sample was created to target 90/10 confidence and precision at the program-level, assuming a coefficient of variation (C_v) equal to 0.5.

For the evaluation period of May 1, 2016 – April 30, 2017, rebated air source heat pumps and central air conditioners were the largest measure contributors for both reported energy and demand savings. Therefore, these measures received the largest share of research activities and the highest level of rigor with on-site equipment measurement.

The evaluation team requested a participation database extract of 2016 and 2017 program results, which included counts and details on installed measures. The distribution of ex ante energy savings based on measure counts from the participation database, shown in Figure 3-1, provided insight to measures with greater influence on total program savings.

Figure 3-1: Reported Energy Savings



Central air conditioners, heat pumps, and bundled measures (smart thermostat, quality install) accounted for 80% of reported energy savings. The sampling plan designed for the evaluation period is included in Table 3-2.

Table 3-2: Impact Sampling Plan

Measure	Metering and/or Verification Sites		Phone Survey	
	Achieved	Targeted	Achieved	Targeted
Central Air Conditioner				
Tier 1	1	1	3	2
Tier 2	23	16	24	24
Tier 3	4	4	6	6
Air Source Heat Pump				
Tier 1	3	3	3	3
Tier 2	11	14	20	20
Tier 3	4	4	6	5
Geothermal Heat Pump	n/a	n/a	1	1
Smart Thermostat*	n/a	n/a	31	29
Quality Install*	n/a	n/a	27	31
Attic Insulation & Air Seal	n/a	n/a	3	2
Variable Speed Pool Pump	n/a	n/a	4	4
Duct Sealing	n/a	n/a	1	1
Duct Insulation	n/a	n/a	1	1
Heat Pump Water Heater	n/a	n/a	1	1
Total	**46**	**42**	**73***	**70***

*Targeted and achieved phone sample size counts for Smart Thermostat and Quality Install are imbedded within phone sample size counts for Central Air Conditioner and Air Source Heat Pump.

3.4 Description of Analysis

The evaluation team applied varying analysis techniques depending on the measure, the measure's prominence within the program, and the availability of data on baseline and retrofit savings. A database of program participation provided useful information about measures installed, participants, as well as additional inputs that varied by measure and informed the analysis. Table 3-3 shows the type of analysis applied to each measure.

Table 3-3: Analysis Approach

Measure	Achieved
Central Air Conditioner	Metering study and desk analysis
Air Source Heat Pump	Metering study and desk analysis
Geothermal Heat Pump	Desk analysis
Smart Thermostat	Desk analysis and secondary research
Quality Install	Metering study and desk analysis
Attic Insulation & Air Seal	Desk analysis
Variable Speed Pool Pump	Desk analysis
Duct Sealing	Desk analysis
Heat Pump Water Heater	Deemed

*Energy savings for the Quality Install measure were based on metering data collected for the EFLH Study

3.4.1 Metering study

Given that a large share of overall program savings is derived from air source heat pumps and central air conditioners, an end-use metering approach was applied for the analysis of these two measures. There are three primary inputs needed to calculate residential HVAC savings. The units' heating/cooling efficiencies and capacities were provided by the program database. The third input, hours of operation, has the highest level of uncertainty and the metering study enabled us to estimate cooling and heating Equivalent Full Load Hours (EFLH) for the program. The methodology used for the metering study follows the Uniform Methods Project (UMP) and most closely resembles IPMVP Option A: Partial Retrofit Isolation/Metered Equipment.

3.4.1.1 Data Collection

To complete the metering study, field engineers were dispatched to the homes of Smart $aver participants who received a rebate for an air source heat pump or central air conditioner replacement. Participants who took part in the metering study were provided a $75 incentive divided across two visits to their home. Forty-six sites were metered across all the DEC territory. Two data sets were dropped due to data quality and ultimately 44 sites, including 28 central air conditioners and 16 air source heat pumps, were used in the analysis. All meters were installed in February 2017 and collected in July 2017 ensuring that ample data was available during both the cooling and heating seasons.

During site visits, field engineers performed various data collection activities. Voltage, amperage, and power factor spot measurements were taken on each unit while in operation. Unit specifications, including capacity, were obtained from each system's nameplate information. Finally, a HOBO CTV-A current transducer (CT) was connected on the conductors supplying electricity to the condensing unit located on the exterior of the home to record electrical current measurements. The CT was paired with a U12-006 data logger that stored current data at 10 minute intervals. The result was a trended data log of electrical current between February and July.

Data collected during the metering study was used in a regression analysis that supplied an estimated EFLH for both cooling and heating periods.

3.4.2 Analysis, Regression, EFLH Calculation

Three primary inputs are required to estimate annual cooling and heating savings for air source heat pumps and central air conditioners:

1. Capacity - the size (kBtuh) of the efficient unit
2. Efficiency - the SEER or Heating Seasonal Performance Factor (HSPF) value of the efficient unit
3. Equivalent Full Load Hours (EFLH) - how often the unit is in operation at full capacity

EFLH is an effective measure for estimating the cooling and heating requirement for a specific region and provides a comparison of energy use between regions and equipment types. The general form for the EFLH term is shown in Equation 3-1.

Equation 3-1: Effective Full Load Hours

$$EFLH_{cool} = \sum_{h=1}^{8760} \frac{Estimated\ Hourly\ Load\ (kW)}{Connected\ Load\ (kW)}$$

Where:

Estimated Hourly Load = *Electric demand of the unit in hour h*
Connected Load = *Electric demand draw of the unit when operating at full power*

The evaluation team assigned a connected load to each unit in the sample using nameplate size, efficiency, and spot measurements of voltage and power factor collected on-site. Hourly load was obtained from the logger data and was divided by the connected load to calculate the unit's runtime for each hour in the evaluated period.

The evaluation team collected hourly weather records for the full metering period (February 2017 through July 2017) from six weather stations in North and South Carolina, and assigned each sampled customer to one of six weather stations based on proximity, in order to develop a relationship between observed HVAC system usage runtimes and outdoor temperature. In addition, the evaluation team obtained data for typical meteorological year (TMY3) weather for each location and applied the observed relationship between runtimes and weather to the TMY3 data to estimate annual $EFLH_{heat}$ and $EFLH_{cool}$ for a typical year.

The evaluation team originally intended to utilize the program database to segment the sample based on customer tier levels and estimate EFLH separately for each tier group. However, due to an unbalanced sample, as well as restrictions related to small sample sizes within a segmented dataset, we were not able to confidently estimate EFLH separately by tier. Instead, the evaluation team used an aggregated EFLH value across all tiers. The assumption that EFLH is consistent across different tiers is based on the fact that the heating or cooling load for a home is independent of the efficiency of the HVAC system that conditions the space. A higher

efficiency air conditioner may run additional hours during the day, but it does so by consuming energy at a level below full load and removing heat from the home at a slower rate. This system saves energy by operating below full load for longer periods of time but the EFLH, a product of hours operating at given power level, remains constant.

As mentioned above, units were metered from February through July 2017. Because the metering period covered both cooling, heating, and shoulder seasons, and the regression analysis was performed twice to estimate annual $EFLH_{cool}$ and annual $EFLH_{heat}$ separately. The evaluation team split the meter data into two separate datasets. The first dataset contained only observations where average daily temperatures exceeded the base temperature of 65°F, or where temperatures indicated cooling. The second dataset contained observations where average daily temperatures fell below the base temperature of 65°F, or where outdoor temperatures indicated heating.

The evaluation team developed weather-normalized estimates of $EFLH_{cool}$ for each unit in the sample using a linear regression model of observed runtimes as a function of the observed cooling degree days (base 65°F) during the cooling season. Figure 3-2 shows the relationship between average daily runtimes (hours) and cooling degree days. Each blue + represents the average air conditioning runtime in hours for each day in the cooling dataset, i.e. each day with an average temperature exceeding 65°F.

Figure 3-2: Cooling Runtime as a Function of Temperature

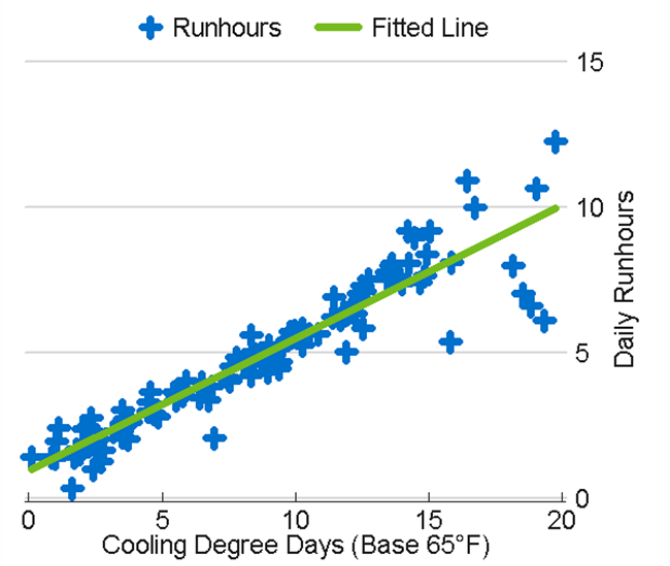


Table 3-4 shows the regression output for the relationship described in Figure 3-2. The key value to consider is the Cooling Degree Day (CDD) coefficient of 0.54. This term indicates that DEC customers use an average of 0.54 hours, or approximately 33 minutes, of additional cooling per CDD.

Table 3-4: $EFLH_{cool}$ Regression Output

Model Term	Coefficient	Std. Err.	t-stat	P-value	[90% Confidence Interval]
CDD	0.54	0.005	104.71	0.000	± 1.6%

The evaluation team ran a similar linear regression model to develop weather-normalized estimates of $EFLH_{heat}$ for each air source heat pump unit. The key difference is that instead of CDD, the model estimated runtimes as a function of observed Heating Degree Days (HDD) during the heating season.

Figure 3-3 shows the relationship between average daily runtimes and heating degree days. Each blue + represents the average air source heat pump runtime in hours for each day in the heating dataset, i.e. each day with an average daily temperature below 65°F.

Figure 3-3: Heating Runtime as a Function of Temperature

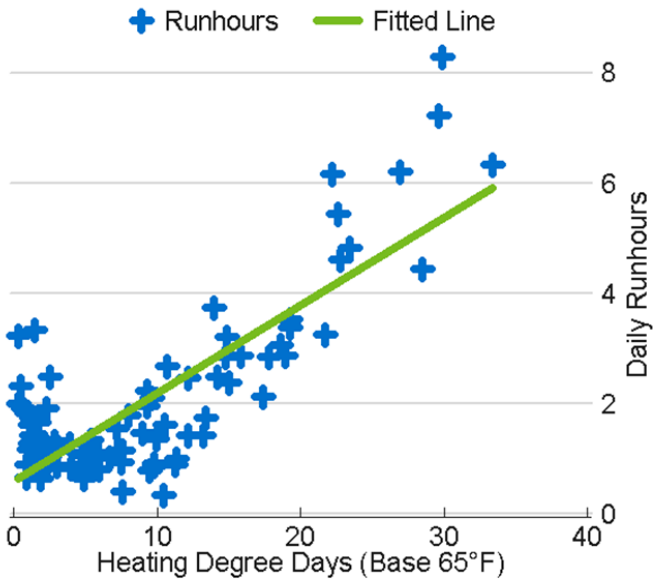


Table 3-5 shows the regression output for the relationship described in Figure 3-3. The coefficient term 0.19 indicates that DEC customers use an average of 0.19 hours, or approximately 12 minutes, of additional heating per HDD.

Table 3-5: $EFLH_{heat}$ Regression Output

Model Term	Coefficient	Std. Err.	t-stat	P-value	[90% Confidence Interval]
HDD	0.19	0.006	33.70	0.000	± 4.9%

The evaluation team utilized hourly TMY3 data for Carolina weather stations to calculate annual CDD and HDD and used those values to estimate $EFLH_{cool}$ and $EFLH_{heat}$ for each customer region. Table 3-6 shows regression coefficients, annual CDD, annual HDD, and estimated EFLH values for each season. $EFLH_{cool}$ and $EFLH_{heat}$ were calculated by multiplying each term's regression coefficient by the average CDD and HDD values determined by TMY3 data.

Table 3-6: EFLH Calculations

Term	Regression Coefficient	Annual CDD (Base 64°F)	Annual HDD (Base 65°F)	$EFLH_{cool}$ (hours)	$EFLH_{heat}$ (hours)
CDD	0.54	1,393	-	752	-
HDD	0.19	-	3,674		698

The field data collected by Nexant also provided the peak summer cooling demand coincidence factor (CF_{summer}). Just as EFLH is a necessary component of the annual energy savings calculation, peak coincidence factor is a necessary component of the peak demand savings calculation. Peak demand coincidence factor is defined here as the probability that the cooling equipment is operating during system peak hours. The basic form for the CF term is a ratio of hourly load to full load during a given hour of the day, and is shown in Equation 3-2.

Equation 3-2: Coincidence Factor

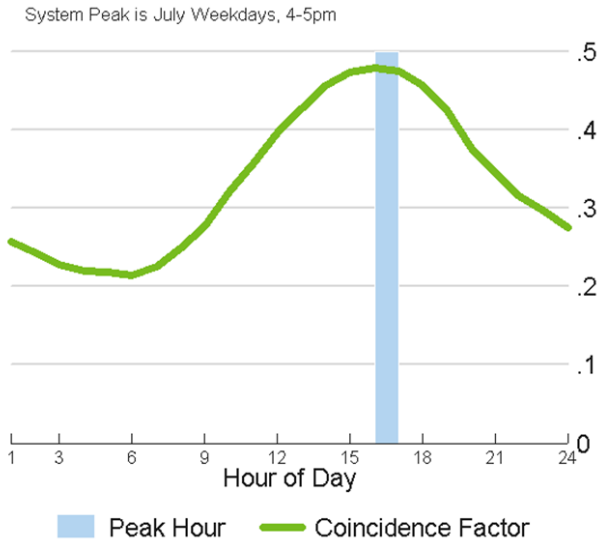
$$CF_h = \frac{Hourly\ Load_h\ (kW)}{Full\ Load\ (kW)}$$

Where:

Hourly Load = *Electric demand of the unit at hour h*
Full Load = *Electric demand draw of the unit when operating at full power*

The evaluation team calculated the peak demand coincidence factor to estimate peak demand savings for the sample. A system's peak demand period refers to the period during which the highest level of power is needed to satisfy its electric demand requirement. DEC defines its summer peak period as July weekdays between 4:00pm and 5:00pm (hour ending 17). Figure 3-4 shows the average CF_{summer} load curve for each weekday of July 2017 for the metered sample. The system's peak period is highlighted in light blue. The CF_{summer} during the system peak is 0.47.

Figure 3-4: Summer Peak Demand Coincidence Factor



A winter peak coincidence factor (CF_{winter}) was not able to be estimated through the metering study because the metering period did not coincide with the timeframe during which DEC's winter peak is defined. DEC defines its winter peak period as January weekdays between 7:00am and 8:00am (hour ending 8). However, due to the evaluation schedule, loggers were installed in early February and we were unable to collect January usage information to estimate winter demand coincidence factor for the Carolinas territory. Since we were unable to estimate a program specific winter demand CF, the evaluation team applied the estimated CF_{winter} found through a similar 2016 metering study performed in DEP territory in order to calculate winter demand (kW) savings. Although the Duke Energy Progress (DEP) and Carolinas service territories boarder each other, differences in geography like mountains or coastal regions result in varying HVAC needs across the two territories. Applying the CF_{winter} found in the DEP evaluation is a strong approximation of performance in DEC, but the uncertainty is increased due to variations in program participants and their location.

3.4.2.1 Central Air Conditioner and Air Source Heat Pump Savings Calculation

Energy and demand savings for central air conditioners and air source heat pumps were determined by engineering algorithms shown in Table 3-7 using the inputs provided in Table 3-8 and Table 3-12.

Table 3-7: Algorithms for HVAC Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right)$
Summer Cooling Demand Savings	$\Delta kW_{cool} = Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right) \times CF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{HSPF_{ee}}\right)$
Winter Heating Demand Savings	$\Delta kW_{heat} = Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{HSPF_{ee}}\right) \times CF_{heat}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-8: Inputs for Central AC Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$Capacity_{cool}$	kBtuh	1	33.8	Population average
		2	32.0	
		3	32.8	
$SEER_{base}$	SEER	All	14[1]	Code minimum
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.7	
		3	18.1	
CF_{summer}	n/a	All	0.475	Metering study
CF_{winter}	n/a	All	0.588	Metering study

Electrically Commutated Motor Savings

For participants who received an electrically commutated motor (ECM) as part of their central air conditioner replacement, the evaluation team estimated the savings impacts resulting from the fan operation in conjunction with a furnace during the heating season. To estimate this impact, we leveraged primary ECM metered data collected previously by the evaluation team in Duke Energy's Progress territory as well as secondary research to establish baseline conditions. The ECM metered data provided five minute amperage intervals which we used in combination with recorded voltage and power factor measurements to estimate the average power draw of an

[1] The results of the participant survey found no existing central air conditioners were in good working condition when replaced. Therefore, an early replacement adjustment was not applicable.

ECM in operating mode. Our secondary research[2] found that ECMs use half the energy of a standard fan motor when used in residential furnace applications. This insight was applied to estimate baseline fan usage.

To calculate savings, we applied an estimated annual effective full load hours (EFLH) for furnaces to our estimated baseline and ECM power draw. The evaluation team calculated the ECM savings as the difference in consumption between the baseline and ECM fans. We further adjusted the estimated ECM savings by applying the percentage of customers in the program who received an ECM with their new system (86%) as well as by the saturation of residential customers with central air conditioners and forced air furnaces (52%) based on Duke Energy's 2013 residential appliance saturation study (RASS). The algorithm applied to estimate ECM fan savings during the heating season (Table 3-9) along with DEC centric inputs (Table 3-10) are included below.

Table 3-9: Algorithm for ECM Fan Energy and Demand Savings

Calculation	Equation
ECM Fan, furnace, energy savings	$\Delta kWh_{furnace} = EFLH_{furnace} \times Power_{ECM} \times System\ Type\ Adj \times Program\ ECM\ Adj$

Table 3-10: Inputs for Central AC Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{furnace}$	Hours	All	359	Metering study
$Power_{ECM}$	kW	All	0.191	DEP metering study
System Type Adj	%	All	52%[3]	2013 Duke RASS
Program ECM Adj	%	All	86%[4]	DEC Program Database

Energy and demand savings for central air conditioners are presented in Table 3-11.

[2] Pigg, Scott and Talerico, Tom. 2004. "Electricity Savings from Variable-Speed Furnaces in Cold Climates" in *ACEEE 2004 Summer Study on Energy Efficiency in Buildings*, *Panel 1, Paper 23*, http://aceee.org/files/proceedings/2004/data/papers/SS04_Panel1_Paper23.pdf

[3] Penetration of central AC systems paired with forced air furnaces in Duke Progress territory per the 2013 RASS

[4] Accounts for participants who only replaced the central AC condensing unit and cooling coil without improving the blower section of the HVAC system

Table 3-11: Central AC Gross Verified Savings

Season	Tier	Energy Savings (kWh)*	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	1	36[5]	0.022[3]	0
	2	182	0.115	
	3	395	0.250	
Heating	All	31	0	0.167
Total	**1**	**66[3]**	**0.022[3]**	**0.167**
	2	**212**	**0.115**	
	3	**426**	**0.250**	

*Rounding error present

Savings for air source heat pumps (Table 3-12 and Table 3-14) apply a split baseline, based on participant responses to the process survey. For this evaluation 6.9% of air source heat pump participants stated their systems were “in good working order” and “not old”, and received early replacement energy savings based on a 10 SEER and 6.8 HSPF baseline heat pump.

[5] Tier 1 energy and demand savings include savings associated with program-required quality installation.

Table 3-12: Inputs for Air Source Heat Pump Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$EFLH_{heat}$	Hours	All	698	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	1	29.7	Population average
		2	30.2	
		3	32.8	
Early Replacement (ER%)	%	All	6.9%	Process Survey
$SEER_{base\ ,early\ replacement}$	SEER	All	10[6]	Mid-Atlantic TRM
$SEER_{base,replace\ on\ failure}$	SEER	All	14	Code minimum
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.5	
		3	18.3	
$HSPF_{base}$	HSPF	All	6.8/8.2[4]	Code minimum
$HSPF_{ee}$	HSPF	1	8.4	Population average
		2	8.8	
		3	9.7	
CF_{summer}	n/a	All	0.475	Metering study
CF_{winter}	n/a	All	0.588	Metering study

Calculation of savings related to spilt baselines considers each scenario (early replacement and replace on failure) separately, and then calculates a spilt baseline by multiplying each component by the percentage of units that meet the conditions of a given scenario (Table 3-13).

[6] The results of the participant survey found 6.9% of Air Source Heat Pump Replacement participants considered their previous system was “in good working order”. An early replacement baseline of 10 SEER and 6.8 HSPF was applied to 6.9% of the population to reflect this finding.

Table 3-13: Algorithm for Split Baseline Savings

Calculation	Equation
Early Replacement, Cooling Energy Savings	$\Delta kWh_{cool,ER} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base,ER}} - \frac{1}{SEER_{ee}}\right)$
Replace on Failure, Cooling Energy Savings	$\Delta kWh_{cool,ROF} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base,ROF}} - \frac{1}{SEER_{ee}}\right)$
Heat Pump, Cooling Energy Savings	$\Delta kWh_{cool,\ split\ baseline} = \Delta kWh_{cool,ER} \times ER\% + \Delta kWh_{cool,ROF} \times (1 - ER\%)$

Table 3-14: Air Source Heat Pump Gross Verified Savings

Season	Tier	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	1	73[7]	0.046[5]	0
	2	199	0.126	
	3	463	0.293	
Heating	1	98[5]	0	0.082[5]
	2	216		0.182
	3	463		0.390
Total	**1**	**171**[5]	0.046[5]	0.082[5]
	2	**415**	0.126	0.182
	3	**926**	0.293	0.390

3.4.2.2 Geothermal Heat Pump Savings Calculation

Geothermal heat pumps make use of constant ground temperature to provide heating and cooling and operate at higher efficiency levels than air source heat pumps. The Smart $aver Program provides incentives for these systems to encourage participants to install higher efficiency HVAC systems in their homes. Geothermal heat pumps were excluded from the EFLH metering study; however, the evaluation team estimated savings based on the assumption that heating and cooling EFLH for a geothermal heat pump are equivalent to an air source heat pump.

[7] Tier 1 energy and demand savings include savings associated with program required quality installation

Table 3-15: Algorithms for Geothermal Heat Pump Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right)$
Summer Cooling Demand Savings	$\Delta kW_{cool} = Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right) \times CF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{COP_{retrofit} \times 3.412}\right)$
Winter Heating Demand Savings	$\Delta kW_{heat} = Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{COP_{retrofit} \times 3.412}\right) \times CF_{heat}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-16: Inputs for Geothermal Heat Pump Gross Verified Savings

Input	Units	Value	Source
$EFLH_{cool}$	Hours	752	Metering study
$EFLH_{heat}$	Hours	698	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	49.6	Population average
$SEER_{base}$	SEER	14	Program minimum
$SEER_{ee}$	SEER	24.2	Population average
$HSPF_{base}$	HSPF	8.2	Program minimum
$COP_{retrofit}$	COP	3.7	Assumed
CF_{cool}	N/A	0.475	Metering study
CF_{heat}	N/A	0.588	Metering study

Table 3-17: Geothermal Heat Pump Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	1,124	0.710	1.274
Heating	1,513		
Total	**2,637**		

3.4.2.3 Quality Installation Energy Savings

The Quality Installation (QI) measure provides HVAC technicians a process to ensure that new equipment is properly tuned and operating at a high efficiency level when installed. The QI process includes:

- Measuring the sub-cool or superheat charge of the condenser
  - System must be allowed to run for at least 15 minutes prior to measuring charge
- Measuring the liquid and suction line pressures
- Completing a return and supply enthalpy conversion
- Measuring static pressure in the return and supply ducts
- Measuring the system level airflow.

The HVAC technician uses these measurements to calculate a cooling capacity for the unit while in operation. The QI requires that the system performance achieve at least 90% of the net capacity as rated by the Air-conditioning, Heating, & Refrigeration Institute (AHRI).

QI is required for all Tier 1 HVAC units rebated through the Smart $aver Program. For Tiers 2 and 3, an additional incentive is offered if the contractor completed the QI process.

The evaluation team based its verification of QI energy and demand savings estimates on a review of contractor submitted QI data collection sheets and metering data from the Duke Energy Carolinas EFLH study. Along with the program specific steps, secondary research was completed to provide an industry estimate for the level of energy savings expected when a QI process is implemented during the installation of new residential HVAC equipment.

The evaluation team completed a review of 210 QI data collection sheets from the program (70 each from the tier) provided by DEC. These sheets tracked the inputs and calculations completed by HVAC technicians as they installed a participant's new HVAC system and progressed through the QI process. The evaluation focused on the accuracy of the inputs and calculations on the QI data collection sheets to determine if the process was properly applied. Based on the review of these QI data sheets, 60% contained one or more of the following issues:

- Failure to achieve a calculated operational cooling capacity inside the 90%-110% range
- Application of an industry rule of thumb (airflow = 400 cfm/tom) instead of directly measuring the parameter
- Measurements taken below 60° F ambient air temperature on standard QI data collection forms

Based on this review the evaluation de-rated savings from the measure by 60% to reflect the issues discovered (Table 3-18).

Table 3-18: Summary of Quality Installation De-rate Components

Quality Installation Measurement	Count
Cooling Capacity Outside of 90-110%	71
Airflow Rule of Thumb Applied	65
QI Performed Below 60 °F	48
Total QI Sheets with Issues	122[8]
QI Data Sheets for Comparison	202
Savings De-rate Percentage	**60%**

Additionally, the evaluation team found 11% of the QIs were completed as 'Cold Weather Quality Installations' which is a simplified QI data collection process applied when ambient temperatures are below 70° F. Because the accuracy of charge readings of HVAC systems decreases as the ambient temperature falls below 70° F, the HVAC technician is not able to collect the charge data to needed to calculate the operating capacity of the system. Therefore, systems installed in these weather conditions cannot qualify for the program's QI process. Ultimately the evaluation team determined 11% of QIs were completed in these conditions. This finding did not influence the per unit energy and demand savings for QI measure, but the evaluation team did reduce the reported count of QI participants by 11% to reflect systems installed during cold weather (Table 3-19).

Table 3-19: Summary of Quality Installation Cold Weather Installs

Quality Installation Data Type	Count
Cold Weather Sheets Removed	25
Total QI Data Sheet Reviewed	227
QI Participation Reduction	**11%**

The evaluation team based the verification of savings attributable to the QI measure on meter data collected during the Duke Energy Carolinas EFLH study. We estimated and compared the efficiency level (based on the ratio of kW/ton) of systems with and without QI and calculated improvements in efficiency from systems that received QI were attributed to the measure. This analysis found a SEER efficiency improvement of 1.37%, which when reduced by 60% (based on issues discovered on the QI data collection forms) provided a measure-level savings estimate of 0.54%. To quantify the impact this increased efficiency had on energy and demand savings, the evaluation team defined a QI efficiency level by increasing the program-level SEER and HSPF values by 0.54% and calculated the savings impact relative to the non-QI SEER and HSPF as detailed in Table 3-20 below.

[8] Some Quality Install data sheets included multiple issues so the values above do not sum to 122

Table 3-20: Algorithms for Quality Installation Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{ee}} - \frac{1}{(1+ESF_{QI}) \times SEER_{ee}}\right)$
Summer Cooling Demand Savings	$\Delta kW_{cool} = Cap_{cool} \times \left(\frac{1}{SEER_{ee}} - \frac{1}{(1+ESF_{QI}) \times SEER_{ee}}\right) \times CF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{ee}} - \frac{1}{(1+ESF_{QI}) \times HSPF_{ee}}\right)$
Winter Heating Demand Savings	$\Delta kW_{heat} = Cap_{heat} \times \left(\frac{1}{HSPF_{ee}} - \frac{1}{(1+ESF_{QI}) \times HSPF_{ee}}\right) \times CF_{heat}$
Algorithm Reference	Modified from Mid-Atlantic TRM, v6.0, May 2016

Table 3-21: Inputs for Quality Installation Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$EFLH_{heat}$	Hours	All	698	Metering study
ESF_{QI}	%	All	0.54%	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	1	29.7	Population average
		2	30.2	
		3	32.8	
$SEER_{base}$	SEER	All	14	Code minimum
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.5	
		3	18.3	
$HSPF_{base}$	HSPF	All	8.2	Code minimum
$HSPF_{ee}$	HSPF	1	8.4	Population average
		2	8.8	
		3	9.7	
CF_{summer}	n/a	All	0.475	Metering study
CF_{winter}	n/a	All	0.588	Metering study

Table 3-22: Quality Installation Verified Savings

System	Tier	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Central Air Conditioner	1	10	0.006	0.000
	2 and 3	8	0.005	0.000
Heat Pump	1[9]	13	0.005	0.011
	2 and 3	21	0.005	0.011

3.4.2.4 Smart Thermostat Energy Savings

Customers who installed an eligible central air conditioner or heat pump had the opportunity to receive a rebate for a qualifying smart thermostat. Because the thermostats were included only in conjunction with a rebated HVAC system, the evaluation team opted to analyze the energy savings impacts for thermostats based on an engineering algorithm informed by the metering analysis and secondary data. The evaluation developed its savings analysis based on estimating the cooling and heating consumption of the retrofitted HVAC system and applying an estimated energy savings factor (ESF) that accounts for the amount of reduced consumption caused by the smart thermostat. This same method and algorithm is provided in the 2015 Indiana TRM (see Table 3-23). The evaluation team did review the Mid-Atlantic TRM; however, that resource specified deemed savings rather than an algorithm that could leverage the primary data collected from the metering study.

Table 3-23: Algorithms for Smart Thermostat Energy Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{ee}}\right) \times ESF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{ee}}\right) \times ESF_{heat}$
Algorithm Reference	Indiana TRM version 2.1, July 2015

As detailed in Table 3-24, the evaluation team applied system capacities, SEER and HSPF values, and EFLH based on the data collected from the metering study as well as from the participant database. The ESF was sourced from the 2015 Indiana TRM. The evaluation team consulted the 2017 Arkansas TRM due to its similar climate zone to the DEC territory; however, the sources used to calculate savings in the Arkansas TRM ultimately rely on similar sources cited in the Indiana TRM. Moreover, the evaluation team felt the savings algorithm suggested in the Indiana TRM was more robust and allowed us to leverage more participant data in calculating the estimated impact. Therefore, we chose that document to estimate the verified impacts for smart thermostats. Based on these assumptions, we estimated the savings impact of the smart thermostats as illustrated in Table 3-25.

Table 3-24: Inputs for Smart Thermostat Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$EFLH_{heat}$	Hours	All	698	Metering study
ESF_{cool}	%	All	13.9%	2015 Indiana TRM
ESF_{heat}	%	All	12.5%	2015 Indiana TRM
$Capacity_{cool\ and\ heat}$	kBtuh	1	29.7	Population average
		2	30.2	
		3	32.8	
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.5	
		3	18.3	
$HSPF_{ee}$	HSPF	1	8.4	Population average
		2	8.8	
		3	9.7	

Table 3-25: Smart Thermostat Verified Savings

System	Tier	Energy Savings (kWh)	Weighted Average Energy Savings (kWh)
Smart Thermostat - Central Air Conditioner	1	248	211
	2	214	
	3	190	
Smart Thermostat - Heat Pump	1	530	499
	2	503	
	3	483	

3.4.3 Engineering Analysis

3.4.3.1 Attic Insulation and Air Sealing

The evaluation considered attic insulation and air sealing data provided by the program database to inform savings calculations. Inputs for the insulation component of the measure included baseline and retrofit insulation R-values and attic area. HVAC system efficiency was assumed to be either SEER 13 or 10 and was modeled using a split baseline, determined by data in the 2016 Duke Energy RASS, to approximate system age across the DEC service area and apply a lower efficiency rating for older units. Validation of the estimated square footage data point showed many input that were inconsistent with the available attic area for a given home. This data appears to be inconsistently provided and for many projects the total home square footage is listed instead of attic insulation area. In order to adjust for this issue potential attic area was verified through the review of publically available housing information.

Adjustments were made by dividing the total home area by the number of stories and reducing attic area by a measure level adjustment factor.

To estimate the impacts of the attic insulation component of this measure, the evaluation team reviewed the savings algorithm from the Mid-Atlantic TRM; however, we found the stipulated algorithm provided lower results that are inconsistent with our expectations of savings from this measure. The evaluation team instead applied the algorithm provided by the Illinois TRM with weather data based on typical meteorological year (TMY3) in Charlotte, NC.

Table 3-26: Algorithms for Attic Insulation Energy and Demand Savings

Calculation	Equation
Cooling Energy Savings	$\Delta kWh_{cool} = CDD \times 24 \times Area \times DUA \times (1 - FramingFactor_{attic}) \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{\eta_{cool} \times 1000}$
Heating Energy Savings	$\Delta kWh_{heat} = HDD \times 24 \times Area \times (1 - FramingFactor_{attic}) \times ADJ_{attic} \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{COP \times 3412} \times Ratio_{ASHP}$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Illinois TRM, v5.0, June 2016

Table 3-27: Inputs for Attic Insulation Energy and Demand Savings

Input	Units	Value	Source
R_{base}	R-value	12.5	Program database average
$R_{retrofit}$	R-value	40.1	Program database average
Area	ft^2	1,268	Program database average; secondary research
CDD	CDD	1,765	TMY3 data
HDD	HDD	2,389	TMY3 data
η_{cool}	SEER	10/13	TRM
COP	COP	1.7/1.9	TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
ADJ_{attic}	%	80%	TRM
DUA	%	75%	TRM
Framing Factor	%	7%	TRM
air source heat pump Ratio	%	47.8%	DEC program database ratio
CF_{summer}	N/A	0.475	Metering study
CF_{winter}	N/A	0.588	Metering study

Table 3-28: Attic Insulation Gross Verified Savings

Season	Energy Savings(kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	179	0.113221	0.211
Heating	251		
Total	**430**		

All participants who installed attic insulation were also required to air seal the attic plane to reduce air leakage from conditioned areas of the home. Savings for this component of the measure are separated from the insulation improvement and calculated using pre- and post-retrofit blower door results provided by the program database. Overall the program achieved an average air leakage reduction of 21% (Table 3-31) in-line with other Duke Energy territories (DEO – 24%, DEI – 21%). Air sealing improvements typically exhibit energy savings greater than the attic insulation portion of the measure, but that's not to the result for this evaluation. Given similar blower door inputs the variation is due to differences in energy savings algorithms provided by the regional TRM applied in each jurisdiction.

Table 3-29: Algorithms for Air Sealing Energy and Demand Savings

Calculation	Equation
Cooling Energy Savings	$\Delta kWh_{cool} = CDH \times DUA \times 60 \times 0.018 \times LM \times \frac{CFM50_{base} - CFM50_{retrofit}}{n - Factor} \times \frac{1}{\eta_{cool} \times 1000}$
Heating Energy Savings	$\Delta kWh_{heat} = HDD \times 60 \times 24 \times 0.018 \times \left(CFM50_{base} - CFM50_{retrofit}\right) \times \frac{1}{COP \times 3412} \times Ratio_{ASHP} \times \frac{1}{n - Factor}$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-30: Inputs for Air Sealing Energy and Demand Savings

Input	Units	Value	Source
CFM_{base}	CFM_{50}	3,733	Program database average
$CFM_{retrofit}$	CFM_{50}	2,941	Program database average
n-Factor	N/A	16.7	Secondary research
CDH	CDH	12,948	TMY3 data
HDD	HDD	2,389	TMY3 data
DUA	Unitless	0.75	Mid-Atlantic TRM
η_{cool}	SEER	10/13	Code minimum
COP	COP	1.7/1.9	Mid-Atlantic TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
Air source heat pump Ratio	%	47.8%	DEC program database ratio
CF_{summer}	N/A	0.475	Metering study
CF_{winter}	N/A	0.588	Metering study

Table 3-31: Air Sealing Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	172	0.108	0.188
Heating	223		
Total	**395**		

Table 3-32: Combined Attic Insulation and Air Sealing Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	350	0.221	0.399
Heating	474		
Total	**824**		

3.4.3.2 Variable Speed Pool Pumps

Variable speed pool pumps save the participant energy by reducing flow rates through a pump and achieving significant energy savings. Reducing pump flow by 50% is expected to save 87% of the energy needed to operate the system. The algorithm use by the evaluation team and the associated parameters are presented in Table 3-33 and Table 3-34. Final verified gross savings are provided in Table 3-35.

While the Mid-Atlantic TRM provides deemed savings values for the variable speed pool pump measure, the evaluation team chose to apply data provided by the Duke Energy Carolinas Smart $aver Program database to reduce the assumptions used and provide more accurate, program specific savings results. To apply this primary program data, we used the algorithm provided by the 2015 Indiana TRM estimates the consumption of a standard single speed pool pump, which applies an energy savings factor (ESF) based on expected usage of a variable speed motor.

Table 3-33: Algorithms for Variable Speed Pool Pump Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh = \frac{HP \times LF \times 0.746}{\eta_{pump}} \times \frac{Hrs}{Day} \times \frac{Days}{Year} \times ESF$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh}{\frac{Hrs}{Day} \times \frac{Days}{Year}} \times CF_{summer}$
Algorithm Reference	Indiana TRM v2.1, July 15, 2015

Table 3-34: Inputs for Variable Speed Pool Pump Gross Verified Savings

Input	Units	Value	Source
HP	Horsepower	2.02	Program database average
Load Factor	%	66%	IN TRM
Pump Efficiency (ηpump)	%	33%	IN TRM
Hours of Use per Day, single speed pump	Hours	6.0	IN TRM
Days of Use per Year	Days	154	Survey responses
Energy Savings Factor	%	91%	IN TRM
CF_{summer}	N/A	0.20	IN TRM

Table 3-35: Variable Speed Pool Pump Gross Verified Savings

Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
2,430	0.53	0.000

3.4.3.3 Duct Sealing

Duct sealing improves the distribution efficiency of a heating or cooling system by patching any openings in the duct system that prevent conditioned air from reaching its intended destination. This results in savings from an HVAC system that can operate less often and still maintain the consistent, comfortable temperature desired by the homeowner. The algorithms used by the evaluation team and the associated parameters are presented in Table 3-36 and Table 3-37. Final verified gross savings are provided in Table 3-38.

Table 3-36: Algorithms for Duct Sealing Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \frac{\Delta CFM25_{DL}}{System\ CFM} \times \frac{1}{\eta_{cool}}$
Summer Cooling Demand Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \frac{\Delta CFM25_{DL}}{System\ CFM} \times \frac{1}{COP \times 3{,}412} \times Ratio_{ASHP}$
Winter Heating Energy Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Heating Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-37: Inputs for Duct Sealing Gross Verified Savings

Input	Units	Value	Source
ΔCFM_{25}	CFM_{25}	134.6	Program database
System CFM	CFM	1,063	Program database
$EFLH_{cool}$	Hours	752	Metering study
$EFLH_{heat}$	Hours	698	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	31.9	Program database
SEER	SEER	10/13	Mid-Atlantic TRM
COP	COP	2.0/2.3	Mid-Atlantic TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
CF_{cool}	N/A	0.475	Metering study
CF_{heat}	N/A	0.588	Metering study

Table 3-38: Duct Sealing Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	256	0.162	0.153
Heating	182		
Total	**438**		

3.4.3.4 Duct Insulation

Duct insulation reduces the thermal transfer of energy between the conditioned air in the duct system and the surrounding conditions, and reduces HVAC system operation. All the duct insulation measures are considered to be in the attic, outside conditioned space, where all heat transferred into or away from the conditioned air is considered outside the thermal envelope of the home. The algorithms used by the evaluation team and the associated parameters are presented in Table 3-39 and Table 3-40. Final verified gross savings are provided in Table 3-41.

Table 3-39: Algorithms for Duct Insulation Energy and Demand Savings

Calculation	Equation
Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times \text{Capacity} \times Area \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{\eta_{cool} \times 1000}$
Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times \text{Capacity} \times Area \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{COP \times 3412} \times Ratio_{ASHP}$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-40: Inputs for Duct Insulation Gross Verified Savings

Input	Units	Value	Source
R_{base}	R-value	1	Program database average
$R_{retrofit}$	R-value	8	Program database average
Duct Diameter	ft	0.667	Engineering assumption
Duct Length	ft	100	Engineering assumption
Area	ft^2	209	Calculated
Capacitycool and heat	kBtuh	31.9	Program database
$EFLH_{cool}$	hours	752	Metering study
$EFLH_{heat}$	hours	698	Metering study
η_{cool}	SEER	10/13	Mid-Atlantic TRM
COP	COP	2.0/2.3	Mid-Atlantic TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
air source heat pump Ratio	%	47.8%	DEC program database ratio
CF_{summer}	N/A	0.475	Metering study
CF_{winter}	N/A	0.588	Metering study

Table 3-41: Duct Insulation Gross Verified Savings

Season	Energy Savings (kWh)*	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	370	0.234	0.222
Heating	263		
Total	**634**		

*rounding error present

3.4.4 Deemed Analysis

Due to low uncertainty on measure savings and low program participation the evaluation team applied deemed savings from the previous evaluation for the heat pump water heater.

3.4.4.1 Heat Pump Water Heater

Energy and demand savings for heat pump water heaters are provided in Table 3-42.

Table 3-42: Heat Pump Water Heater Gross Verified Savings

Energy Savings (kWh)	Summer Demand (kW)	Winter Demand (kW)
1,616	0.124	0.178

3.5 Targeted and Achieved Confidence and Precision

The Smart $aver evaluation plan was developed with the goal of achieving a target goal of 10% relative precision at the 90% confidence interval for the program as a whole. As the program is composed of different measures, and the energy savings estimation approach varies by measure, the evaluation team assigned sampling, verification, and impact estimate effort among the program measures in accordance with the measures' contribution to total reported Smart $aver savings. The evaluation team calculated the relative precision for each of these samples and combined the error bound to calculate a program-level relative precision. As presented in Table 3-43, the evaluation team reported confidence and precision for the program is +/- 9.6% at the 90% confidence level.

Table 3-43: Targeted and Achieved Confidence and Precision

Program	Targeted Confidence/Precision	Achieved Confidence/Precision
Smart $aver	90/10.0	90/9.6

3.6 Results

Measure level, per unit energy savings values are detailed in Figure 3-5, Figure 3-6, Figure 3-7, and Table 3-44. The program's two most active measures in terms of participation, central air conditioners and air source heat pumps, realized a substantially lower per unit savings compared to the reported values. Also, the program did not provide a reported savings estimate

for ground source heat pumps. Therefore, the evaluation team deemed a 100% realization rate for this measure.

Figure 3-5: HVAC Replacement Per Unit Energy Savings

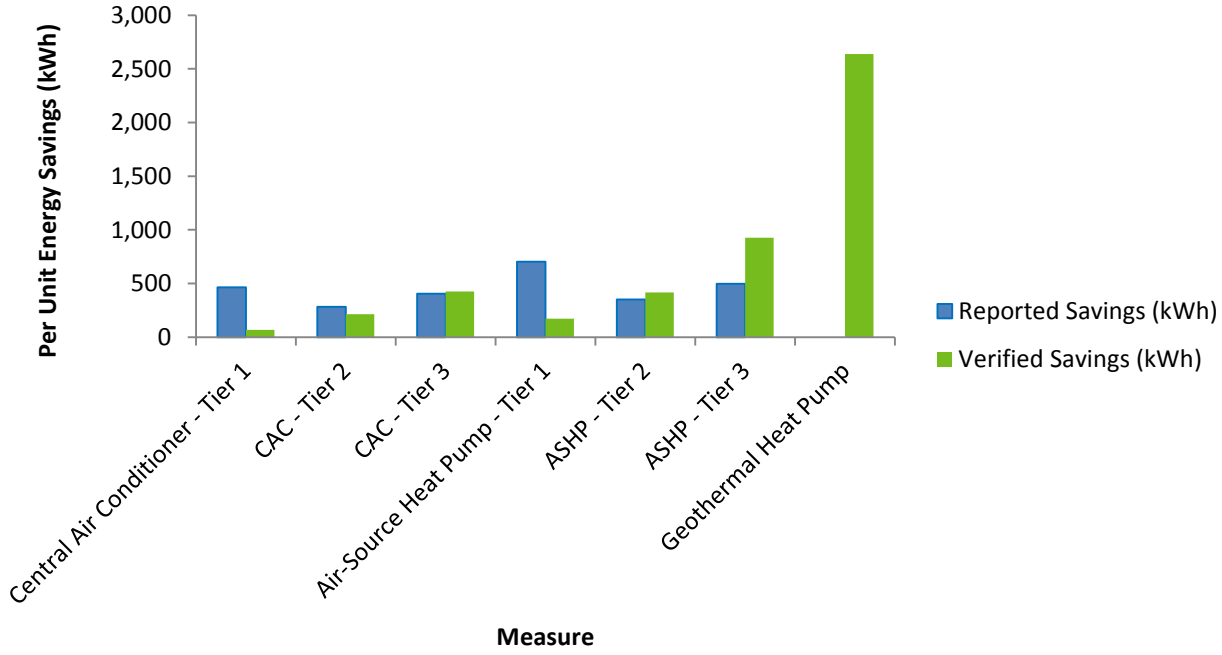


Figure 3-6: HVAC Add-on Per Unit Energy Savings

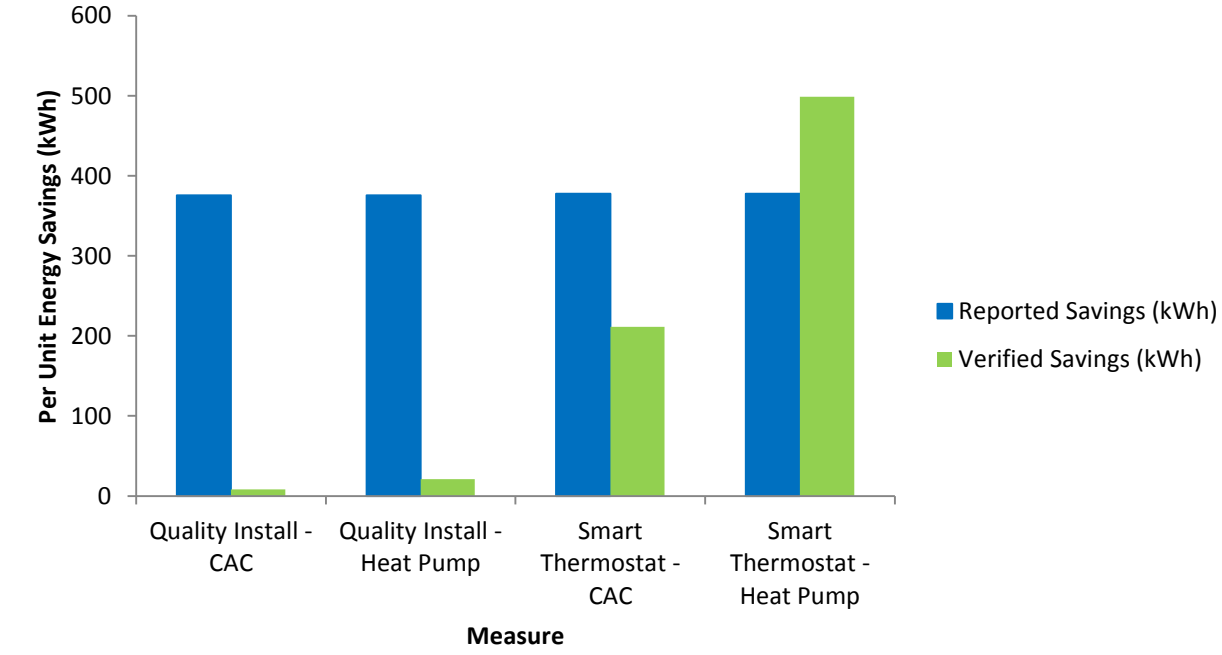


Figure 3-7: Other Measures Per Unit Energy Savings

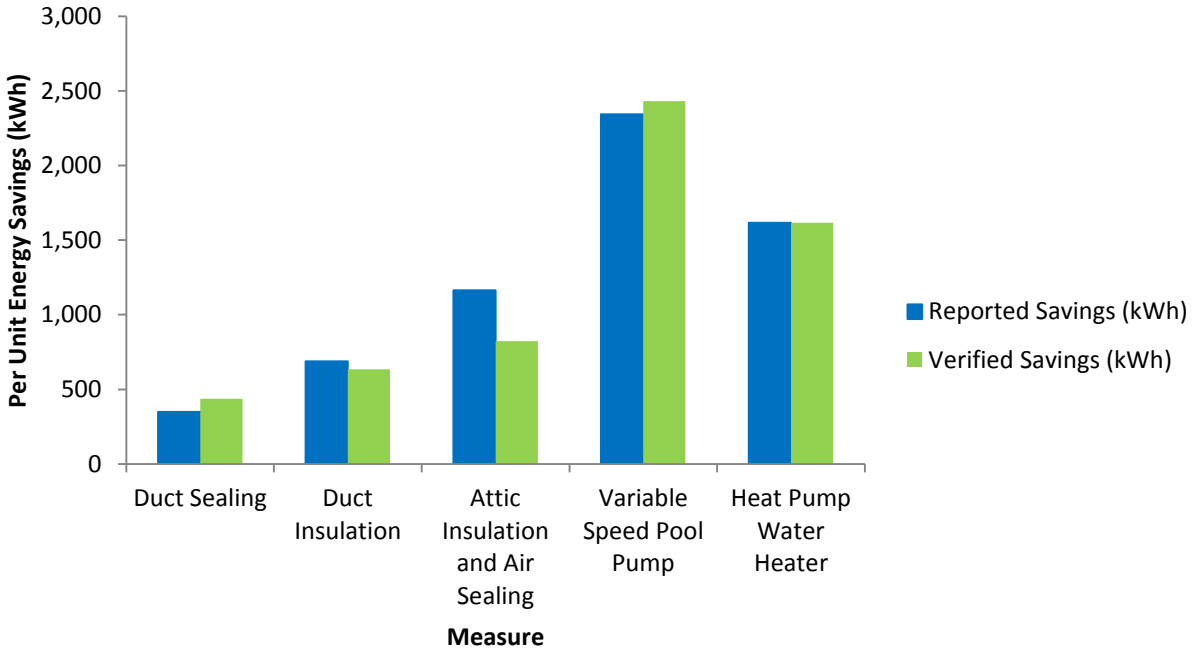


Table 3-44: Measure-Level Reported and Verified Gross Energy Savings

Measure	Tier	Rebated Measures	Reported Energy Savings, per unit (kWh)	Realization Rate	Gross Verified Energy Savings, per unit (kWh)	Total Gross Verified Energy Savings (MWh)
Central Air Conditioner	1	723	464	14.3%	66	47,900
	2	4,679	283	75.1%	212	993,420
	3	867	404	105.5%	426	369,470
Air Source Heat Pump	1	692	702	24.3%	171	118,164
	2	3,996	350	118.8%	415	1,659,605
	3	1,019	496	186.6%	926*	943,158
Geothermal Heat Pump	n/a	34	0	100.0%	2,637*	89,659
Quality Install - CAC	2 and 3	1,989	376	2.2%	8	16,189
Quality Install - Heat Pump	2 and 3	1,251	376	5.6%	21	26,268
Smart Thermostat - CAC	n/a	2,938	377	56.0%	211	620,751
Smart Thermostat - ASHP	n/a	2,388	377	132.1%	499	1,194,014
Variable Speed Pool Pump	n/a	562	2,342	103.8%	2,430	1,365,841
Attic Insulation & Air Seal	n/a	428	1,163	70.9%	824	352,838
Duct Sealing	n/a	163	350	125.1%	438	71,367
Duct Insulation	n/a	48	688	92.1%	634	30,420
Heat Pump Water Heater	n/a	40	1,616	100.0%	1,616	64,640
Total		**21,817**		**83.0%**		**7,960,401**

*The Smart $aver program rebates geothermal heat pumps under Tier 3 HP. As a result, the planning kWh value for Tier 3 HP also includes savings from the Geothermal HP measure; calculated as the total kWh for Tier 3 HP + Total kWh for Geothermal HP divided by the total Tier 3 participation + total Geothermal HP participation = 980.8 kWh

The program realization rate of 83% is driven by a substantial reduction in savings for the quality installation measure. This issue also impacted the Tier 1 central air conditioners and Tier 1 air source heat pumps which include quality installation savings in their reported values and verified savings.

Table 3-45 and Table 3-46 provide the per unit and total verified gross demand savings for the summer and winter seasons. The program realization rates for summer and winter were 70.6% and 196.8%, respectively.

Table 3-45: Measure-Level Reported and Verified Summer Demand Gross Savings[9]

Measure	Tier	Rebated Measures	Reported Summer Demand Savings, per unit (kW)	Realization Rate	Gross Verified Summer Demand Savings, per unit (kW)	Total Gross Verified Summer Demand Savings (MW)
Central Air Conditioner	1	723	0.248	9.0%	0.022	16.25
	2	4,679	0.172	66.7%	0.115	537.02
	3	867	0.274	91.2%	0.250	216.66
Air Source Heat Pump	1	692	0.216	21.4%	0.046	31.96
	2	3,996	0.117	107.5%	0.126	502.57
	3	1,019	0.176	165.8%	0.293*	298.06
Geothermal Heat Pump	n/a	34	0.000	100.0%	0.710*	24.16
Quality Install - CAC	2 and 3	1,989	0.133	3.9%	0.005	10.23
Quality Install - Heat Pump	2 and 3	1,251	0.133	3.8%	0.005	6.31
Smart Thermostat - CAC	n/a	2,938	0.000	100.0%	0.000	0.00
Smart Thermostat - ASHP	n/a	2,388	0.000	100.0%	0.000	0.00
Variable Speed Pool Pump	n/a	562	0.590	89.3%	0.527	296.21
Attic Insulation & Air Seal	n/a	428	0.184	120.0%	0.221	94.74
Duct Sealing	n/a	163	0.291	55.5%	0.162	26.36
Duct Insulation	n/a	48	0.573	40.9%	0.234	11.24
Heat Pump Water Heater	n/a	40	0.124	100.0%	0.124	4.96
Total		**21,817**		**70.6%**		**2,076.7**

*The Smart $aver program rebates geothermal heat pumps under Tier 3 HP. As a result, the planning Summer kW value for Tier 3 HP also includes savings from the Geothermal HP measure; calculated as the total Summer kW for Tier 3 HP + Total Summer kW for Geothermal HP divided by the total Tier 3 participation + total Geothermal HP participation = 0.306 kW

[9] Summer demand savings for all HVAC dependent measures are based on the summer coincident peak determined by the EFLH study.

Table 3-46: Measure-Level Reported and Verified Winter Demand Gross Savings

Measure	Tier	Rebated Measures	Reported Winter Demand Savings, per unit (kW)	Realization Rate	Gross Verified Winter Demand Savings, per unit (kW)	Total Gross Verified Winter Demand Savings (MW)
Central Air Conditioner	1	723	0.046	362.1%	0.167	120.44
	2	4,679	0.038	438.4%	0.167	779.47
	3	867	-0.010	n/a	0.167	144.43
Air Source Heat Pump	1	692	0.251	32.8%	0.082	56.93
	2	3,996	0.144	126.4%	0.182	728.09
	3	1,019	-0.046	n/a	0.390*	397.18
Geothermal Heat Pump	n/a	34	0.000	100.0%	1.274*	43.33
Quality Install - CAC	2 and 3	1,989	0.084	0.0%	0.000	0.00
Quality Install - Heat Pump	2 and 3	1,251	0.084	13.0%	0.011	13.71
Smart Thermostat - CAC	n/a	2,938	0.000	100.0%	0.000	0.00
Smart Thermostat - ASHP	n/a	2,388	0.000	100.0%	0.000	0.00
Variable Speed Pool Pump	n/a	562	n/a	100.0%	0.000	0.00
Attic Insulation & Air Seal	n/a	428	0.194	205.8%	0.399	170.94
Duct Sealing	n/a	163	0.000	100.0%	0.153	24.98
Duct Insulation	n/a	48	0.000	100.0%	0.222	10.65
Heat Pump Water Heater	n/a	40	0.178	100.0%	0.178	7.12
Total		**21,817**		**196.8%**		**2,497.1**

*The Smart $aver program rebates geothermal heat pumps under Tier 3 HP. As a result, the planning Winter kW value for Tier 3 HP also includes savings from the Geothermal HP measure; calculated as the total Winter kW for Tier 3 HP + Total Winter kW for Geothermal HP divided by the total Tier 3 participation + total Geothermal HP participation = 0.418 kW

Table 3-47 and Table 3-48 present the reported and verified energy and demand savings for 2016.

Table 3-47: 2016 Program Level Energy Savings

Measures Installed	Reported Energy (kWh)	Realization Rate	Gross Verified Energy (kWh)	Net-to-Gross Ratio	Net Verified Energy (kWh)
21,817	9,598,932	83.0%	7,960,401	66.7%	5,308,068

Table 3-48: 2016 Program Level Demand Savings

Measurement	Reported Demand (MW)	Realization Rate	Gross Verified Demand (MW)	Net-to-Gross Ratio	Net Verified Demand (MW)
Summer Demand	2.94	70.6%	2.08	66.7%	1.38
Winter Demand	1.27	196.8%	2.50		1.67

4 Net-to-Gross Methodology and Results

The evaluation team calculated the net savings, which are the amount of savings that occurred as a direct result of influence attributable to the program, by applying net-to-gross (NTG) adjustments to the gross savings. The evaluation team determined the NTG adjustment value via data collected from participant and trade ally surveys.

To calculate net savings, a NTG ratio must first be established. NTG consists of free ridership (FR) and spillover (SO). Free ridership refers to the portion of energy savings that participants would have achieved in the absence of the program through their own initiatives and expenditures (U.S. DOE, 2014).[1] Spillover refers to the program-induced adoption of measures by non-participants and participants who did not receive financial incentives or technical assistance for installations of measures supported by the program (U.S. DOE, 2014). The evaluation team used the following formula to calculate a NTG ratio:

$$NTG = 1 - FR + SO$$

Once the NTG ratio is established, the evaluation team used the following formula to calculate net savings:

$$Net\ Savings = Gross\ Savings * NTG$$

The evaluation team estimated nonparticipant spillover and quality install free ridership from trade ally survey data and estimated participant free ridership and spillover from participant surveys. The following sections describe how the evaluation team estimated participant free ridership and spillover values.

4.1 Free Ridership

Free ridership estimates how much the program influenced participants to make the energy saving improvements that the program incents, which is then used to adjust gross savings by the level of attribution the program is able to claim. Free ridership ranges from 0 to 1, with 0 being no free ridership (or, total program attribution), 1 being total free ridership (or, no program attribution) and values in between represent varying degrees of partial free ridership. The evaluation team used participant and trade ally survey data to inform free ridership estimates. Since an individual's free ridership may differ between different measure types, free ridership was first calculated individually for each measure associated with each participant survey respondent. Free ridership for the quality install measure was calculated in a similar respondent-level manner for trade allies. The evaluation team then used the respondent-measure-level free ridership values to derive a program-level free ridership estimate. This chapter describes this process.

1 The U.S. Department of Energy (DOE) (2014). *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 23: Estimating Net Savings: Common Practices.* Retrieved August 29, 2016 from http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf

4.1.1 Participant-Measure-Level Free Ridership

Participant-measure-level free ridership consists of two components – change (FRC) and influence (FRI) – which both range from 0 to .5.[2] The following formula uses these two components to calculate participant-measure-level free ridership:

$$FR = FRC + FRI$$

4.1.1.1 Free Ridership Change

Free ridership change demonstrates what the participant would have likely done if the program had not provided an incentive for their energy upgrade. To determine this, the evaluation team asked participant survey respondents FRC questions specific to the measures they installed. The generic example below exemplifies how the evaluation team collected FRC data (see Appendix C for the measure-specific FRC questions in the participant survey).

> *Q1. If you had not received a Duke Energy incentive for your [PIPE IN INCENTED MEASURE], which of the following is most likely: Would you have…? [READ ALL, SELECT ONE]*
>
> *1. Not purchased a [PIPE IN INCENTED MEASURE]*
> *2. Delayed purchasing a new [PIPE IN INCENTED MEASURE] for at least a year*
> *3. Purchased a new [PIPE IN INCENTED MEASURE] but a less efficient or less expensive model*
> *4. Bought the exact same [PIPE IN INCENTED MEASURE] anyway, and paid the full cost yourself*
> *5. Or done something else, specify:_____*
> *98. Don't know*
> *99. Refused*

[2] Since most quality install rebate participants were unaware of the quality installation rebates, we used trade ally survey data to estimate free ridership for the measure. See section 4.1.1.3 for quality install free ridership estimation methods.

For insulation[3] and replacement equipment with less efficient options,[4] the evaluation team asked a follow up question to respondents that reported the third response option above (purchased a less efficient or less expensive measure), as exemplified below:

> *Q2. [ASK IF Q1=3] You said you would have bought a [PIPE IN INCENTED MEASURE] that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy. Do you think it is more likely that you would have bought equipment that was…?*
>
> *1. Almost as efficient as the one you bought, or*
> *2. Significantly less efficient than the one you bought*
> *98. Don't know*
> *99. Refused*

The evaluation team then assigned the following FRC values to each respondent for each rebated measure, based on their response to the questions above, as shown in the Table 4-1.

Table 4-1: Free Ridership Change Values

Q1 Response	Q2 Response	FRC Value
Not purchased a [MEASURE]		0.0
Delayed purchasing a new [MEASURE] for at least a year		0.0
Purchased a new [MEASURE] but a less efficient or less expensive model	Almost as efficient as the one you bought	0.375*
	Significantly less efficient than the one you bought	0.125*
	Don't know / Refused	0.25*
Bought the exact same [MEASURE] anyway, and paid the full cost yourself		0.50
Or done something else		FRC values assigned on a case by case basis, depending on which pre-coded response item they most resemble
Don't know / Refused		Measure average

* Since the less efficient version would be a standard efficiency model (which serves as the baseline from which savings are claimed), these values are set to 0 for smart thermostats and pool pumps. Additionally, the values vary for ASHPs and CACs, based on replacement condition and incentive tier (Table 4-2).

3 Respondents that report they would have installed less insulation will then be asked to report how much less insulation they would have purchased in a percentage format (e.g.: 50% less). This reported value will be subtracted from 100% and then divided in half; the result will serve as their FRC value.

4 Since duct sealing is a service measure, as compared to an equipment measure, there is no less efficient version. Thus, the counterfactual for service measures would be to either: 1) not purchase the service, 2) wait a year or more to purchase the service, or 3) purchase the service without the assistance of a rebate. Accordingly, FRC values for service measures are either 0 (would have not purchased or would have waited a year or more to purchase) or .5 (would have purchased without assistance of a rebate). Also, since the less efficient/expensive version of pool pumps and wi-fi thermostats would be the baseline, 'purchased a different unit' responses result in a FRC value of 0.

Participants who replaced a broken HVAC system pose a particular challenge to NTG (or FRC, specifically): because there is an immediate space heating or cooling need, it is possible that free ridership could be higher for some in this group, as "replacement upon burnout" participants may be less likely to report they would not purchase or would delay purchasing a replacement measure (which are responses that traditionally garner FRC scores of 0). These issues expose the possibility of higher free ridership scores for "replacement upon burnout" participants when using the algorithm in Table 4-1. Since the counterfactual of taking no action is not a realistic scenario for "replacement upon burnout" participants, we used a special FRC algorithm for air source heat pump and central air conditioner participants that assigns FRC scores of 0 to certain "replacement upon burnout" participants that indicated they would bought a less expensive or less energy efficient heating or cooling system as their counterfactual response (Table 4-2). This is the most prudent approach since:

1) Tier 1 incentives are effectively ECM incentives, since Tier 1 only requires the code minimum for SEER standards.

2) Savings are calculated based on a code SEER level baseline assumption.

3) For "replacement upon burnout" participants, the most realistic counterfactual that would result in the least efficient outcome is installing a less efficient unit than the one they installed through the program – which would be a code unit in certain counterfactual scenarios.

As seen in Table 4-2, this unique FRC algorithm takes SEER level of the incented unit into account. "Replacement upon burnout" participants who installed units exceeding minimum program requirements that said they would have installed an "almost as efficient" unit reveal that the program did not motivate them to purchase a unit above code in the first place, but rather motivated them purchase an even more efficient unit than they would have otherwise. Thus, these "replacement upon burnout" participants are partial free riders (given that their counterfactual outcome would likely still be above code) and garner a FRC value of 0.375.

Table 4-2: FRC Follow Up Values for Air-Source Heat Pumps and Central Air Conditioners

Follow Up Response	Incentive Tier	Replacement Upon Burnout*	FRC Value
Almost as efficient as the one you bought	1	Yes	0
		No	0.375
	2 or 3	Yes or No	0.375
Significantly less efficient than the one you bought	All	Yes	0
		No	0.125
Don't know / Refused	1	Yes	0
	2 or 3	Yes or No	0.25

* Replacement upon burnout represents respondents who indicated they replaced an "old" or "broken" unit.

The following tables show the count of respondents for each measure that chose each option in Table 4-1 or Table 4-2, as well as the resulting mean FRC value for each measure.

Table 4-3: Free Ridership Change Values: Geothermal Heat Pump (n=1)

Q1 Response	Q2 Response	FRC Value	Count Choosing Option
Not purchased a geothermal heat pump		0.0	0
Delayed purchase for at least one year		0.0	0
Bought a less expensive or less energy efficient heating and cooling system	Almost as efficient as the one you bought	0.375	0
	Significantly less efficient than the one you bought	0.125	0
	Don't know / Refused	0.25	0
Bought the exact same geothermal heat pump anyway, and paid the full cost yourself		0.50	1
Or done something else		Assigned on a case by case basis	0
Don't know / Refused		Measure average	0
Mean FRC value: geothermal heat pump		**0.50**	

Table 4-4: Free Ridership Change Values: Air Source Heat Pump (n=29)

Q1 Response	Q2 Response	Incentive Tier	Replacement Upon Burnout	FRC Value	Count Choosing Option
Not purchased an air source heat pump	N/A	N/A	Yes or No	0.0	0
Delayed purchase for at least a year	N/A	N/A	Yes or No	0.0	4
Bought a less expensive or less energy efficient heating and cooling system	Almost as efficient as the one you bought	1	Yes	0.0	1
			No	0.375	0
		2 or 3	Yes or No	0.375	2
	Significantly less efficient than the one you bought	All	Yes	0.0	0
			No	0.125	1
	Don't know / Refused	1	Yes	0.0	0
		2 or 3	Yes or No	0.25	0
Bought the exact same air source heat pump anyway, and paid the full cost yourself	N/A	N/A	Yes or No	0.50	21

Q1 Response	Q2 Response	Incentive Tier	Replacement Upon Burnout	FRC Value	Count Choosing Option
Or done something else	N/A	N/A	Yes or No	Assigned on a case by case basis	0
Don't know / Refused	N/A	N/A	Yes or No	Measure average	0
Mean FRC value: air source heat pump				**0.39**	

Table 4-5: Free Ridership Change Values: Central Air Conditioner (n=33)

Q1 Response	Q2 Response	Incentive Tier	Replacement Upon Burnout	FRC Value	Count Choosing Option
Not purchased a central air conditioner	N/A	N/A	Yes or No	0.0	0
Delayed purchase for at least a year	N/A	N/A	Yes or No	0.0	2
Bought a less expensive or less energy efficient cooling system	Almost as efficient as the one you bought	1	Yes	0.0	1
			No	0.375	0
		2 or 3	Yes or No	0.375	2
	Significantly less efficient than the one you bought	All	Yes	0.0	1
			No	0.125	0
	Don't know / Refused	1	Yes	0.0	0
		2 or 3	Yes or No	0.25	0
Bought the exact same central air conditioner anyway, and paid the full cost yourself	N/A	N/A	Yes or No	0.50	23
Or done something else	N/A	N/A	Yes or No	Assigned on a case by case basis	1
Don't know / Refused	N/A	N/A	Yes or No	Measure average	3
Mean FRC value: central air conditioner				**0.42**	

Table 4-6: Free Ridership Change Values: Heat Pump Water Heater (n=1)

Q1 Response	Q2 Response	FRC Value	Count Choosing Option
Not installed a heat pump water heater		0.0	0
Postponed the purchase for at least one year		0.0	0
Purchased a new heat pump water heater, but a less efficient or less expensive model	Almost as efficient as the one you bought	0.375	0
	Significantly less efficient than the one you bought	0.125	0
	Don't know / Refused	0.25	0
Bought the exact heat pump water heater anyway, and paid the full cost yourself		0.50	1
Or done something else		Assigned on a case by case basis	0
Don't know / Refused		Measure average	0
Mean FRC value: heat pump water heater		**0.50**	

Table 4-7: Free Ridership Change Values: Attic Insulation (n=5)

Q1 Response	Q2 Response	FRC Value	Count Choosing Option
Would not have done the attic insulation		0.0	0
Postponed attic insulation for at least one year		0.0	3
Would have added less insulation	% less they would have added	reported value subtracted from 100% and then divided in half	0
Done the exact same upgrade, and paid the full cost yourself		0.50	2
Or done something else		Assigned on a case by case basis	0
Don't know / Refused		Measure average	0
Mean FRC value: attic insulation		**0.20**	

Table 4-8: Free Ridership Change Values: Duct Sealing (n=1)

Q1 Response	FRC Value	Count Choosing Option
Would not have done the duct sealing project	0.0	0
Postponed duct sealing project for at least one year	0.0	1
Done the exact same upgrade, and paid the full cost yourself	0.50	0
Or done something else	Assigned on a case by case basis	0
Don't know / Refused	Measure average	0
Mean FRC value: duct sealing	**0.00**	

Table 4-9: Free Ridership Change Values: Pool Pump (n=4)

Q1 Response	FRC Value	Count Choosing Option
Not installed/replaced a pool pump	0.0	0
Postponed the purchase for at least one year	0.0	0
Would have bought a less expensive or less energy efficient pool pump	0.0	2
Bought the exact pool pump anyway, and paid the full cost yourself	0.50	2
Or done something else	Assigned on a case by case basis	0
Don't know / Refused	Measure average	0
Mean FRC value: pool pump	**0.25**	

Table 4-10: Free Ridership Change Values: Smart Thermostat (n=32)

Q1 Response	FRC Value	Count Choosing Option
Not purchased wi-fi thermostat	0.0	3
Postponed the purchase for at least one year	0.0	0
Would have bought a different type of thermostat	0.0	12
Bought the exact wi-fi thermostat anyway, and paid the full cost yourself	0.50	14
Or done something else	Assigned on a case by case basis	2
Don't know / Refused	Measure average	1
Mean FRC value: pool pump	**0.24**	

4.1.1.2 Free Ridership Influence

Free ridership influence demonstrates how much influence the program had on a participant's decision to perform the incented energy upgrade. To determine this, the evaluation team asked participant survey respondents the following question, repeating this battery for each unique rebated measure associated with the respondent:

> *I'm going to read a list of factors that might have influenced your decision to make the energy saving improvements to your property we have been talking about. For each factor, please indicate how influential it was in your decision, using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential."*
>
> *[INTERVIEWER NOTE: IF RESPONDENT SAYS 'NOT APPLICABLE; I DIDN'T GET/USE THAT,' THEN FOLLOW UP WITH: "So would you say it was "not at all influential?" AND PROBE TO CODE]*
>
> *[PROGRAMMER: For each factor below input 0-10 scale and don't know and refused options.]*
>
> *a. The rebate received*
> *b. Information or advertisements from Duke Energy, including their website*
> *c. Recommendation from your contractor*
> *d. Did anything else influence you? If so, please specify: _____*
> *[INTERVIEWER: PROBE IF UNCLEAR. RECORD VERBATIM RESPONSE]*

The evaluation team then selected the highest rated program-attributable item for each respondent and assigned the following FRI scores, depending on their high score value (Table 4-11).

Table 4-11: Free Ridership Influence Values

Max Influence Rating	FRI Value
0	0.5
1	0.45
2	0.4
3	0.35
4	0.3
5	0.25
6	0.2
7	0.15
8	0.1
9	0.05
10	0
Don’t know / Refused	Measure average

Table 4-12 shows the count of respondents for each measure associated with each max influence rating and FRI value in Table 4 11, as well as the resulting mean max influence and FRI values for each measure.

Table 4-12: Free Ridership Influence Values, by Measure

Max Influence Rating	FRI Value	Count with Max Influence Rating/FRI Value							
		Heat Pump (Air Source) (n=29)	Attic Insulation and Air Sealing (n=5)	Central Air Conditioner (n=33)	Duct Sealing (n=1)	Heat Pump (Geothermal) (n=1)	Heat Pump Water Heater (n=1)	Pool Pump (n=4)	Smart Thermostat (n=32)
0	0.5	0	0	0	0	0	0	0	1
1	0.45	0	0	0	0	0	0	0	0
2	0.4	0	0	0	0	0	0	0	0
3	0.35	0	0	0	0	0	0	0	0
4	0.3	0	0	0	0	0	0	0	0
5	0.25	0	0	0	0	0	0	0	2
6	0.2	1	0	0	0	0	1	0	1
7	0.15	2	1	4	0	0	0	0	0
8	0.1	6	1	7	0	0	0	2	8
9	0.05	5	0	6	0	0	0	0	5
10	0	15	3	16	1	1	0	2	15
Don't know / Refused	Measure average	0	0	0	0	0	0	0	0
Mean max influence		**9**	**9**	**9**	**10**	**10**	**6**	**9**	**9**
Mean FRI score		**0.05**	**0.05**	**0.05**	**0.00**	**0.00**	**0.20**	**0.05**	**0.07**

4.1.1.3 Quality Install Free Ridership

As seen in the Process Evaluation Findings chapter, participants were largely unaware of that they received a rebate for the quality installation service. Given this finding and the measure's goal of influencing trade ally installation practices (as compared to consumer purchasing decisions), we used trade ally surveys to estimate free ridership for quality install. To inform free ridership estimates, we asked trade allies that performed quality installations the following questions:

[Base: IF PERFORMED QUALITY INSTALLS]
Q15. As you may know, Duke Energy recently added "quality install" requirements for installations of heat pumps and air conditioners? Were you already doing all the techniques on the quality install check list prior to Duke requiring them?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]
Q16. Prior to using Duke's quality install checklist, did you have a system in place to document that your installers were following these same quality install techniques?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]
Q17. Prior to using Duke's quality install checklist, what specific quality install techniques were you using? Please be as specific as possible.

[Multiple response, do not read]
1. System capacity
2. Airflow / static pressure
3. System CFM (cubic feet per minute)
4. Condenser measurements
5. Enthalpy conversion
6. Blower door tests
7. Duct blaster tests
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Much like the participant-based free ridership algorithm, we used a two-component approach to estimate free ridership for quality install. Respondent-level free ridership is the result of summing FR_A and FR_B, both of which range from 0 to .5 (Figure 4-1). Trade allies that did not indicate they were using all the Duke Energy quality install techniques prior to the introduction of the Smart $aver quality install measure (Q15) received scores of 0 for both FR_A and FR_B, resulting in 0% free ridership for the measure. Trade allies that said yes to Q15 were scored as partial to full free riders, depending on their answers to Q16-Q17.

Figure 4-1: Quality Installation Free Ridership Algorithm

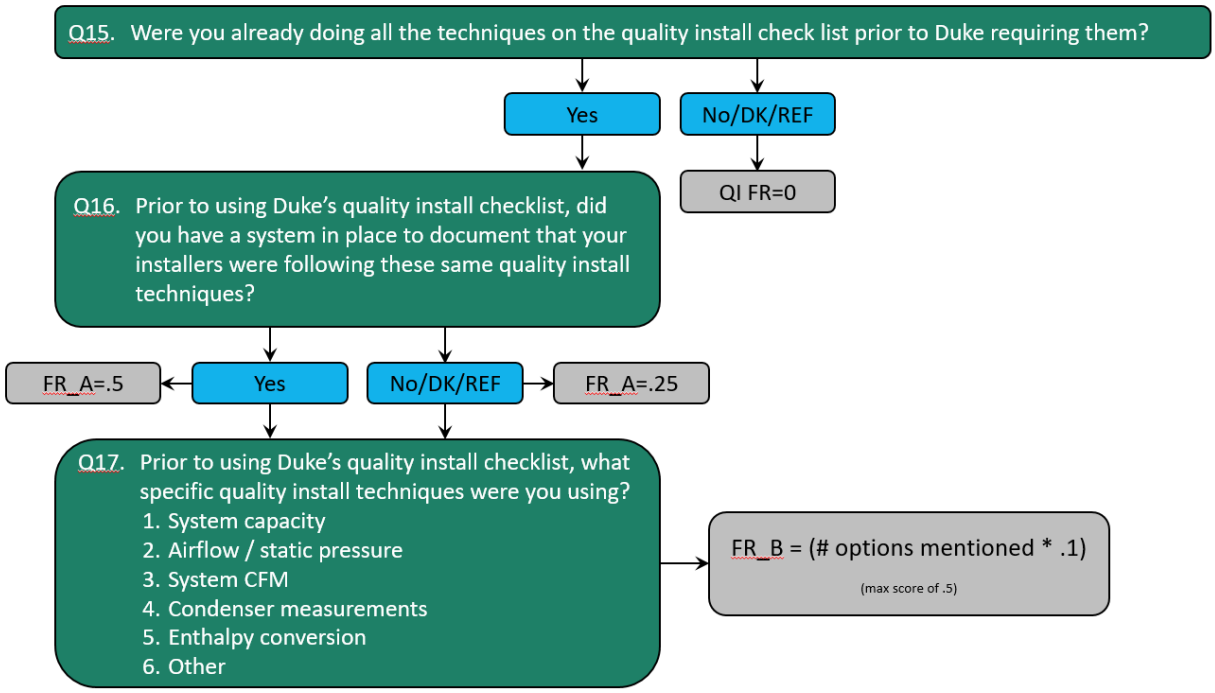


Table 4-13 shows the count of respondents associated with each FR_A score in Figure 4-1, as well as the resulting mean FR_A value for Quality Installation.

Table 4-13: Quality Install FR_A Values (n=28)

Q15 Response	Q16 Response	FR_A Value	Count Choosing Option
No		0.0	5
Don't know / Refused		0.0	1
Yes	Yes	0.5	19
	No	0.25	3
	Don't know / Refused	0.25	0
Mean QI FR_A value		**0.37**	

Table 4-14 shows the count of respondents associated with each FR_B score in Figure 4-1, as well as the resulting mean FR_B value for Quality Installation.

Table 4-14: Quality Install FR_B Values (n=28)

Q17 Response	FR_B Value	Count Choosing Option
System capacity	+.1	4
Airflow / static pressure	+.1	8
System CFM (cubic feet per minute)	+.1	1
Condenser measurements	+.1	4
Enthalpy conversion	+.1	3
Other	+.1	8
Q15=No / Don't know / Refused	0	6
Mean QI FR_B value	**0.10**	

The algorithm seen in Figure 4-1 resulted in free ridership scores for each trade ally that performed the quality installation measure. We then calculated a weighted average of the respondent-level scores to inform free ridership at the program level. We weighted respondent scores by the number of quality installation jobs each trade ally performed during the evaluation timeframe, resulting in a 0.63 FR score for the Quality Installation measure.

4.1.2 Measure-Level Free Ridership

To provide additional insight and transparency into the free ridership analysis, the evaluation team summed the measure-specific FRC and FRI scores for each respondent resulting in participant-measure-level free ridership (FR) scores. The evaluation team used the participant-measure-level FR scores to calculate an average FR score for each measure type. Table 4-15 exhibits the resulting mean measure-level FR scores, and the number of respondents associated with each mean FR score.

While the measure-level FR scores provide additional detail behind the free ridership analysis, we note that the evaluation was not designed to provide statistically significant measure-level results but rather provide a program-level FR score based on data collected on all program measures (see section 4.1.3 below). Therefore, the measure-level FR scores presented in Table 4-15 should be interpreted as potentially indicative of the rate of FR present but with the caveat of large error bounds due to the low sample sizes. This is particularly applicable to geothermal heat pumps, attic insulation and air sealing, variable speed pool pumps, heat pump water heaters, and duct sealing. These measures comprised a very small percentage of overall program participation and savings and consequently fewer evaluation resources were dedicated to data collection for these measures. As these measures continue to mature in the program and increase their overall share to the impact of the program, additional evaluation resources should be dedicated to assessing the level of free ridership.

Table 4-15: Measure-Level Free Ridership Scores

Measure		Count of respondents with measure	Mean FRC Score	Mean FRI Score	Mean FR Score
Central air conditioner		33	0.42	0.05	0.47
Heat pump	*Air Source*	29	0.39	0.05	0.43
	Geothermal	1	0.50	0.00	0.50
Attic insulation and air sealing		5	0.20	0.05	0.25
Variable speed pool pump		4	0.25	0.05	0.30
Heat pump water heater		1	0.50	0.20	0.70
Duct sealing		1	0.00	0.00	0.00
Smart Thermostat		32	0.24	0.07	0.31
Quality Install*		28	0.37	0.10	0.63

* Unlike other measures that report count of participants with the measure, Quality Install denotes Trade Ally sample size. Quality Install FR_A is reported in the FRC column and FR_B is reported in the FRI column. Note that FR_A and FR_B are unweighted, whereas the mean FR score is weighted by number of QI rebates. Thus, the simple sum of FR_A and FR_B does not equal the mean FR score for the measure.

4.1.3 Program-Level Free Ridership

Next, the evaluation team combined the measure-level FR scores into a program-level FR score. Table 4-16 shows the savings weights used to calculate the program-level FR score. Savings weights were calculated as follows:

$$Savings\ Weight = \frac{Population\ N * Verified\ Savings}{Gross\ Program\ Savings}$$

Table 4-16: Measure-Level Free Ridership Scores and Savings Weights

Measure		Population N	Verified Savings (kWh)	Savings Share (weight)	Mean FR Score
Central air conditioner		6,269	225	18%	0.47
Heat pump	*Air Source*	5,707	477	34%	0.43
	Geothermal	34	2,637	1%	0.50
Attic insulation and air sealing		428	824	4%	0.25
Variable speed pool pump		562	2,430	17%	0.30
Heat pump water heater		40	1,616	1%	0.70
Duct sealing		163	438	1%	0.00
Smart Thermostat		5,326	340	23%	0.31
Quality Install*		3,240	13	1%	0.63

The resulting program-level free ridership is 0.38. Given that the sampling strategy aimed to achieve a representative sample with 90/10 confidence/precision at the program level, the program-level free ridership score was applied to each measure.

4.2 Spillover

Spillover estimates energy savings from non-rebated energy improvements made outside of the program that are influenced by the program, and is used to adjust gross savings by the additional energy savings garnered and the level of attribution the program is able to claim for these non-rebated measures. Spillover ranges from 0 to infinity, with 0 being no spillover and values greater than 0 demonstrating the existence and magnitude of spillover.[1] The evaluation team used participant survey data and trade ally interview and survey data to estimate spillover: participants to inform participant spillover (PSO) and trade allies to inform nonparticipant spillover (NPSO). These two estimates are summed to calculate total program spillover (SO):

$$SO = PSO + NPSO$$

4.2.1 Participant Spillover

The evaluation team asked participant survey respondents to indicate what energy saving measures or services they had implemented since participating in the program to identify potential spillover (see the Participant Survey in Appendix C for the spillover battery). The evaluation team then asked participants to use a 1 to 10 scale, where 1 means “not at all influential” and 10 means “extremely influential,” to indicate how much influence Smart $aver had on their decision to purchase these energy saving measures. This question was repeated for each non-rebated measure category a respondent reported implementing. Table 4-17 exhibits how much program influence, ranging from 0% to 100%, is associated with each scale response to the spillover influence question.

Table 4-17: Participant Spillover Program Influence Values

Reported Smart $aver Influence	Influence Value
0	0.0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9
10	1.00
Don’t know / Refused	0.00

[1] Spillover values can be interpreted as percentages, where 1=100%. Thus, a spillover value of .5 demonstrates a savings value of 50% of gross program savings.

The evaluation team used the measure-specific influence value to calculate the participant measure spillover (PMSO) for each measure that each participant reported. Participant measure spillover is calculated as follows:[2]

$$PMSO = Deemed\ Measure\ Savings * Number\ Installed * Influence\ Value$$

The evaluation team then summed all PMSO values and divided them by the participant sample's gross program savings to calculate the participant spillover estimate:

$$Participant\ SO = \frac{\sum PMSO}{Participant\ Sample\ Gross\ Program\ Savings}$$

This calculation resulted in a Participant SO (PSO) value of 0.02.

4.2.2 Nonparticipant Spillover

Nonparticipant spillover refers to non-rebated program measures implemented by nonparticipants that were directly or indirectly influenced by the program. The evaluation team surveyed 58 trade allies to identify and measure nonparticipant spillover. The evaluation team asked trade allies how many non-rebated measures that they installed in program territory since August. The program savings attributed to these non-rebated measures were discounted by the trade ally's reported level of program influence on their practice of recommending these measures (Table 4-18), and the proportion of their clients with non-rebated measures that were not influenced by their recommendations. Nonparticipant spillover was calculated individually for each of the top three program-qualified measures that each surveyed trade ally installed during the evaluation timeframe.

Table 4-18: Trade Ally Influence Values

Program Influence Rating	Influence Value
0	0.0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9
10	1.0
Don't know / Refused	Measure level average

[2] Deemed savings for non-program spillover measures were referenced from the 2016 Mid-AtlanticTRM.

Thus, nonparticipant measure spillover is calculated as follows:[3]

$$NP\ Measure\ SO = Number\ of\ unrebated\ units\ installed * Program\ Influence * (1 - \%\ of\ respondents\ not\ influenced\ by\ TA\ recommendation)$$

The evaluation team then summed all nonparticipant measure spillover values and divided them by the trade ally sample's gross program savings to calculate the program-level nonparticipant spillover estimate:

$$NPSO = \frac{\sum NP\ Measure\ SO}{Sample\ Program\ Savings}$$

This calculation resulted in a NPSO value of 0.03.

4.2.3 Program-Level Spillover

The evaluation team summed the PSO and NPSO values to calculate the program-level SO value. This calculation resulted in program-level SO of 0.05.

4.3 Net-to-Gross

After combining all FR and SO estimates, NTG for the program is 0.67 (Table 4-19). The evaluation team applied the NTG ratio of 0.67 to program-wide verified gross savings to calculate DEC Smart $aver net savings.

Table 4-19: Net-to-Gross Results

Free Ridership	Spillover	NTG
0.38	0.05	66.7%

[3] NP Measure SO = nonparticipant spillover for a given measure type for a given trade ally. NRMC = non-rebated measure count installed in DEC territory since August 2016. %NRM = percent of non-rebated measures.

5 Process Evaluation

5.1 Summary of Data Collection Activities

The process evaluation is based on telephone interviews and surveys with program and implementer staff, trade allies, and participants (Table 5-1).

Table 5-1: Summary of Process Evaluation Data Collection Activities

Target Group	Method	Sample Size	Confidence/Precision
Program and implementer staff	Phone in-depth interview	2	N/A
High volume trade allies[a]	Phone in-depth interview	5	N/A
Trade allies (various rebate volumes)	Phone survey	58	90/10.3
Participants	Phone survey	73	90/9.6

[a] High volume trade allies are companies in the top 20% of trade allies in terms of number of rebated measures, for a given campaign.

5.1.1 Program and Implementer Staff

The evaluation team conducted interviews with the Smart $aver Program Manager and a senior manager from the implementation staff in order to understand how the program was working and to capture their insights about the program's operations, challenges, expectations, and interactions with market actors.

5.1.2 Trade Allies

Participating contractors – called "trade allies" – are the primary program delivery channel for Smart $aver. In December of 2016, the evaluation team conducted five in-depth interviews with high volume Smart $aver trade allies. The in-depth interviews primarily served to pre-test some questions designed for the subsequent trade ally surveys and to see if any additional unforeseen topics emerged that warranted inclusion in participant or trade ally surveys. After interviewing five trade allies and making some corresponding adjustments to the survey guide, the evaluation team surveyed 58 trade allies in February 2017, asking them about various program topics such as satisfaction with the program and program-related challenges (Table 5-2).

Table 5-2: Trade Ally Research Objectives

Research Objectives
Assess Trade Ally engagement with the program and how they and their customers heard of the program
Assess program satisfaction
Document Trade Ally program experience, including any challenges and opportunities for improving the program
Document Trade Ally perspective about the code changes and the future of the program
Gather data for Net-to-Gross spillover
Ask about Trade Ally firmographics and customer characteristics
Document program influence

The evaluation team contends that trade ally specializations (such as insulation, for example) can significantly shape trade ally experience with the program. The evaluation team monitored the measures that surveyed trade allies had experience with to ensure that the sample was diverse and representative in terms of measure experience. The distribution of the trade ally sample's measure experience generally reflects that of the larger trade ally population (Table 5-3).

Table 5-3: Trade Ally Experience with Smart $aver Measures in 2016

Measure	Number installed in evaluation timeframe	Number installed by TA survey sample	Number TA installers in survey sample
Central Air Conditioner	6,269	831	44
Air-Source Heat Pump	5,707	753	48
Geothermal Heat Pump	428	11	4
Attic Insulation and Air Sealing	428	72	6
Variable Speed Pool Pump	562	72	5
Heat Pump Water Heater	40	2	2
Duct Sealing	163	9	2
Duct Insulation	48	4	3
Smart Thermostat	5,326	905	42
Quality Install (Tier 2 and 3)	3,240	490	22

5.1.3 Participants

In July of 2017, the evaluation team surveyed 73 Smart $aver participants who received rebates through the program. The purpose of this data collection activity was to obtain a more detailed understanding of the customer experience with the program, identify potential areas for program improvement, and collect data to inform NTG estimates. Table 5-4 documents the specific research objectives of the participant survey.

Table 5-4: Participant Research Objectives

Research Objectives
Assess program outreach and marketing
Document customer experience with the program
Document reasons for participation and program influence
Gather feedback needed to estimate Net-to-Gross ratio
Assess population segments the program is reaching

To ensure the results were applicable to the larger participant population, the evaluation team stratified the sample by measure type, thus ensuring that sampled participants were representative of the measures in the population (Table 5-5). Central air conditioners and air-source heat pumps were the most commonly installed measures, accounting for nearly all (90%) installations in the program. Aside from survey respondents that received add-on HVAC measures (smart thermostat or quality install), only one survey respondent received rebates for more than one measure. This respondent received rebates for attic insulation/air sealing and duct sealing, and was asked measure-specific questions for all measures they received rebates for.

Table 5-5: Measures Installed by Participant Sample

Measure Installed	Sample % (n=73)	Participant Population %
Central Air Conditioner	45%	47%
Air-Source Heat Pump	40%	43%
Attic Insulation & Air Sealing	7%	3%
Pool Pump	6%	4%
Geothermal Heat Pump	1%	<1%
Heat Pump Water Heater	1%	<1%
Duct Sealing	1%	1%
Smart Thermostat	45%	62%
Quality Install	38%	38%

5.2 Process Evaluation Findings

The following subsections describe program successes and challenges as well as opportunities for program improvement.

5.2.1 Trade Ally Perspective

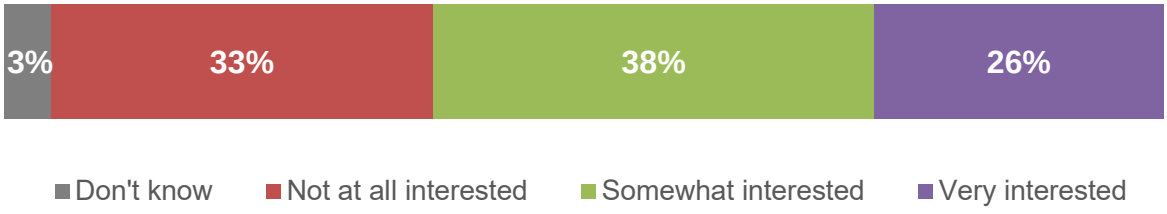
This section reports the results from trade ally surveys regarding their experience participating in the Smart $aver program in the Duke Energy Carolinas jurisdiction.

5.2.1.1 Training

We asked trade allies about their satisfaction with program training, as well as their suggestions for future training opportunities. Overall, trade allies were somewhat dissatisfied with program training opportunities (see Figure 5-10), with trade allies indicating they were dissatisfied because they had not received any program training.

When asked an open-ended question about what other training types they would be interested in, less than half (40%) of surveyed trade allies reported they would be interested in additional training opportunities. Specific training requests varied widely, including training about new rebates and programs offered by Duke Energy and how to fill out required paperwork. When specifically asked to use a 0 to 10 scale to demonstrate their interest in a training course on how to more effectively sell high efficiency equipment, the majority (64%) expressed at least minor interest in sales training (Figure 5-1).

Figure 5-1: Interest in Sales Training (n=58)*

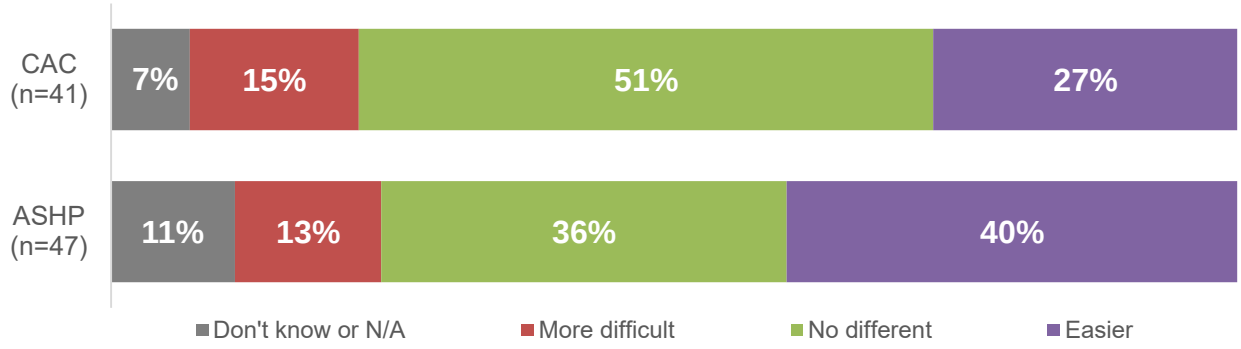


* Respondents used a 0 to 10 scale, where 0 meant “Not at all interested” and 10 meant “Extremely interested.” In the figure above, “Not very interested” represents those selecting “0” through “2”, “Somewhat interested” represents those selecting “3” through “7,” and “Very interested” represents those selecting “8” through “10.”

5.2.1.2 Code Changes

The U.S. Department of Energy revised the efficiency standard for air source heat pumps and central air conditioners; the new standard requires split system air source heat pumps and air conditioners to achieve a 14 SEER minimum for systems manufactured after January 1st, 2015. The revised standards for air source heat pumps and central air conditioners appear to have had moderate effect on sales in the region. About half (51%) of trade allies that installed central air conditioners said it is no easier or more difficult to sell 15 SEER central air conditioners following this code change. However, 40% (19 of 47) of surveyed trade allies that installed air source heat pumps through the program said that it is at least somewhat easier to sell 15 SEER air source heat pumps following the increases in minimum standards (Figure 5-2).

Figure 5-2: Difference in Ease or Difficulty in Selling 15 SEER Central Air Conditioners & Air-Source Heat Pumps Since Code Change*

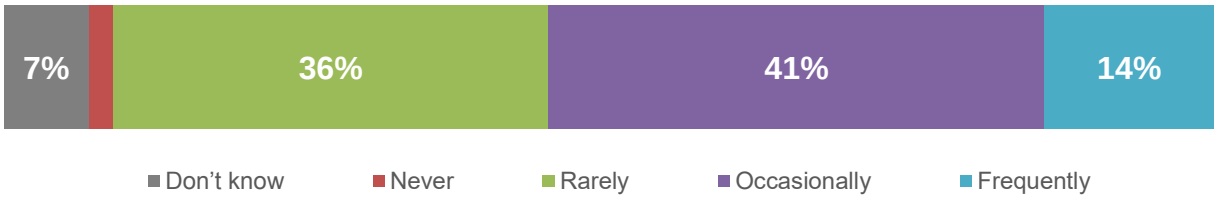


* Excluded respondents who don't sell SEER 15.

5.2.1.3 Recruiting Customers into Smart $aver

Trade ally survey data – which is further corroborated by participant survey data (see section 5.2.2.1) – reveals that trade allies are largely responsible for recruiting customers into the program. While over half of surveyed trade allies (55%) said that their customers "occasionally" or "frequently" ask about Smart $aver rebates, over one-third (38%) said their customers never or rarely ask about the program (Figure 5-3).

Figure 5-3: How Often Customers Ask About Smart $aver Rebates (n=58)

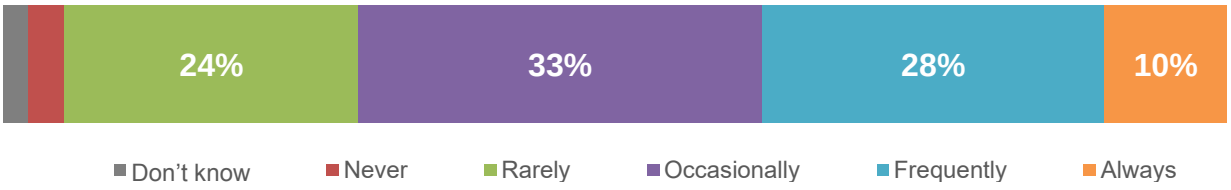


Few trade allies (31%) were highly satisfied with DEC's marketing of the program (see Figure 5-10), with dissatisfied trade allies noting that DEC does not conduct enough Smart $aver marketing. Participant survey results may help corroborate these trade ally reports, as few (6%) surveyed participants explicitly mentioned Duke Energy marketing materials as their source of program awareness. Thus, trade allies often need to educate their customers on the benefits of energy efficiency and the availability of Smart $aver rebates to bring new households into the program.

5.2.1.4 Rebate Application Process

Smart $aver transitioned to an online application system (called the "trade ally portal") in April 2016. We asked trade allies how frequently they have experienced problems or frustrations using the new portal (Figure 5-4). Although most (95%) reported experiencing problems or frustrations with the rebate application process, less than two-fifths (38%) said this was "frequently" or "always."

Figure 5-4: Frequency of Experiencing Problems or Frustrations with Online Rebate Application Process (n=58)



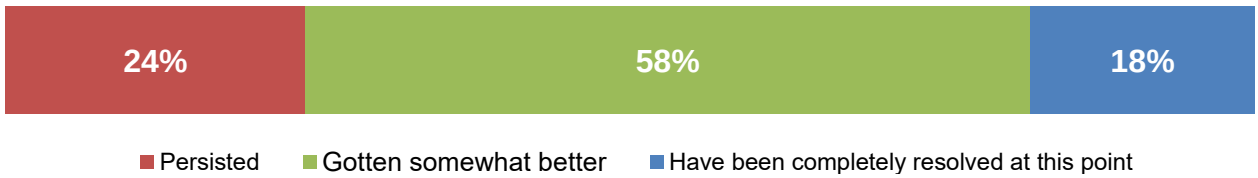
Trade allies that reported experiencing problems or frustrations with the rebate application process (n=55) typically mentioned struggles with uploading to the portal (be it applications or documentation) which can result in needing to resubmit, or indicated that the application process is overly burdensome (Table 5-6).

Table 5-6: Problems and Frustrations with the Rebate Application Process (Multiple Responses Allowed)

Responses	n=55
Data entry and form upload problems / having to resubmit forms	55%
Submission process is difficult, burdensome, or too lengthy	25%
Stringent application requirements	24%
Rebate applications being rejected for unknown or vague reasons	16%
Lack of feedback from Duke regarding rebate status and problems	16%
Resolving application errors is burdensome	13%
Thermostat application issues	11%
Quality Install checklist issues	7%
Rebate tracking issues	5%
Misc. other	40%
Don't know	2%

Echoing the prevalence of these problems and frustrations, the rebate application submission process had the highest level of dissatisfaction in the trade ally satisfaction battery (see Figure 5-10). However, over three-fourths (76%) of trade allies indicated that these problems have gotten at least somewhat better since the rollout of the new portal system (Figure 5-5).

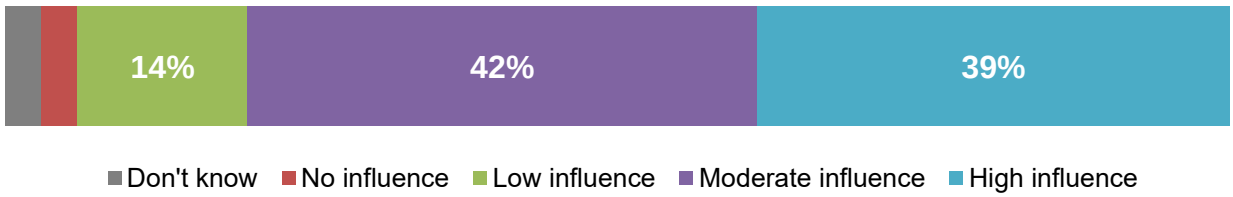
Figure 5-5: Trade Ally Perception of Portal Problems: Persisting vs. Improving (n=55)



5.2.1.5 Program Influence on Trade Allies

Trade ally survey results reveal that the program is influencing energy efficiency contracting services offered by contractors in the trade ally network. Most (62%, or 36 of 58) surveyed trade allies reported their knowledge of energy efficient products and services had increased since they became involved with Smart $aver, 39% of which said the program was highly influential on their increased knowledge (Figure 5-6).

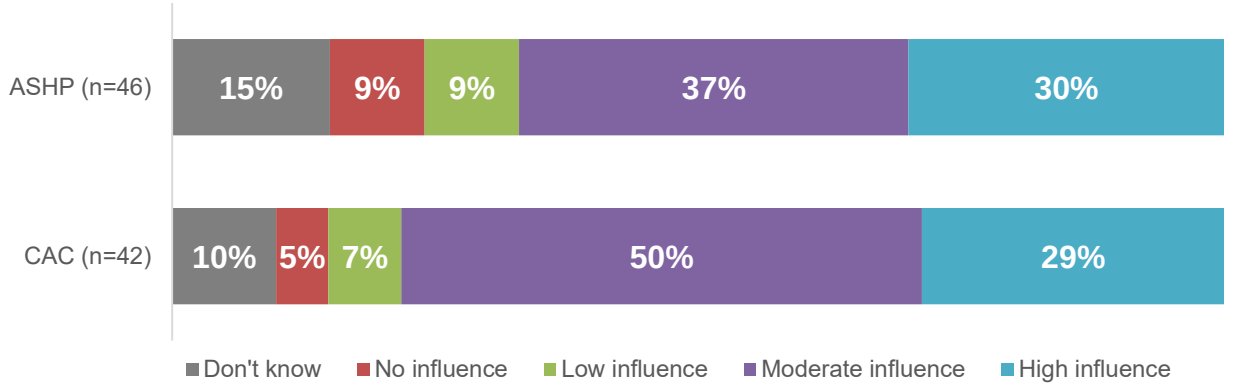
Figure 5-6: Smart $aver Influence on Increased Trade Ally Knowledge of Energy Efficient Products and Services (n=36)*



* Asked on a 0-10 scale, where 0 is “not at all influential” and 10 is “extremely influential.” “No influence” represents trade allies that reported “0,” low influence represents responses ranging from 1 to 3, moderate influence represents responses ranging from 4 to 7, and high influence represents responses ranging from 8 to 10.

Most HVAC trade allies reported that Smart $aver has at least partially influenced their practice of recommending qualifying HVAC measures, with about two-thirds or more – depending on the measure – indicating Smart $aver was moderately or highly influential (Figure 5-7).

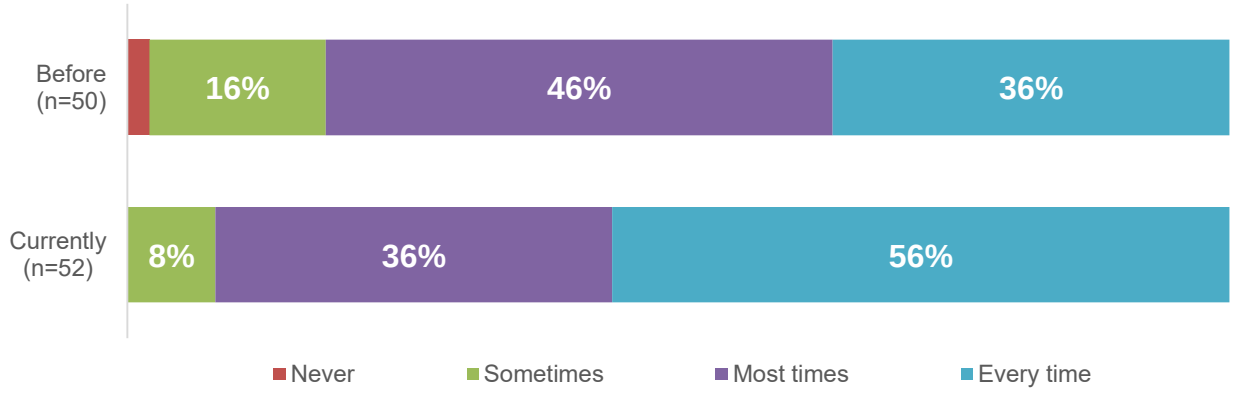
Figure 5-7 Program Influence on Trade Ally Practice of Recommending Program Qualified Measure*



* Asked on a 0-10 scale, where 0 is “not at all influential” and 10 is “extremely influential.” “No influence” represents trade allies that reported “0,” low influence represents responses ranging from 1 to 3, moderate influence represents responses ranging from 4 to 7, and high influence represents responses ranging from 8 to 10. Each row only includes trade allies who had experience with the measure.

Further, survey data reveals that contractors recommend high efficiency equipment more frequently now compared to before they were a participating trade ally in Smart $aver (Figure 5-8). Ultimately, surveyed trade allies revealed that over half of their central air conditioners (57%) or air source heat pumps (60%) installed in 2016 qualified for Smart $aver rebates.

Figure 5-8: Trade Ally Frequency of Recommending High Efficiency Equipment*



* Figure excludes "don't know" and "not applicable" responses. Only trade allies that install equipment measures (HVAC, water heat, and pool pumps) were asked these questions.

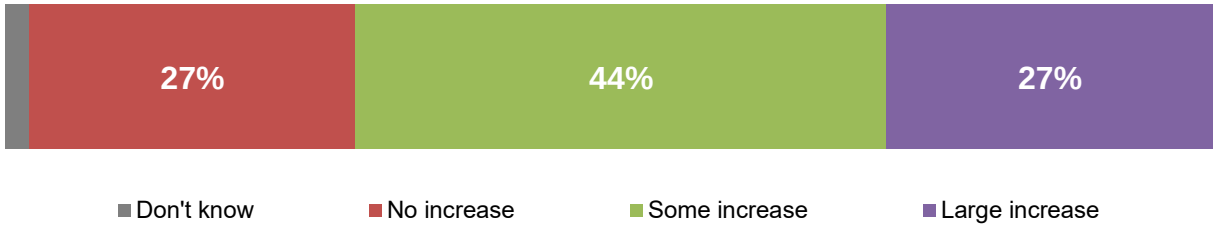
5.2.1.6 New Program Incentives

In April 2016, DEC added several new HVAC incentive offerings to the Smart $aver program:

- Tiered HVAC incentives
- Smart thermostat
- Quality install (QI)

The tiered HVAC rebates increased sales of high SEER units, as almost three-fourths of trade allies that installed CACs (71%) or ASHPs (70%) reported that the higher incentives helped them sell more 15+ SEER units. The smart thermostat incentives also appear to be influential, as almost three-fourths (71%) of HVAC trade allies said they have experienced at least some increase in smart thermostat installations since the introduction of the new incentive offering (Figure 5-9).

Figure 5-9: Smart $aver Effect on Trade Ally Smart Thermostat Installation Volume (n=41)



Almost 80% (22 of 28) of trade allies that performed quality installations reported they were already doing all the techniques on the quality install checklist prior to Duke Energy requiring them. Of these trade allies, most (19 of 22) said they had a system in place to document that their installers were following the same QI techniques. However, when trade allies were asked which specific QI techniques they previously used, only one mentioned all the primary components required in the Duke Energy QI checklist. Trade allies most commonly reported 'airflow and static pressure' as a previously used QI technique (mentioned by 8 of the 22 trade allies that reported previously using quality install techniques) (Table 5-7).

Table 5-7: Previous Quality Install Techniques Used by Trade Allies (Multiple Responses Allowed)

Quality Install Technique	Count (n=22)
Airflow/static pressure*	8
System capacity*	4
Condenser measurements*	4
Blower door tests	4
Enthalpy conversion*	3
System CFM*	1
Other	8
Don't know	8

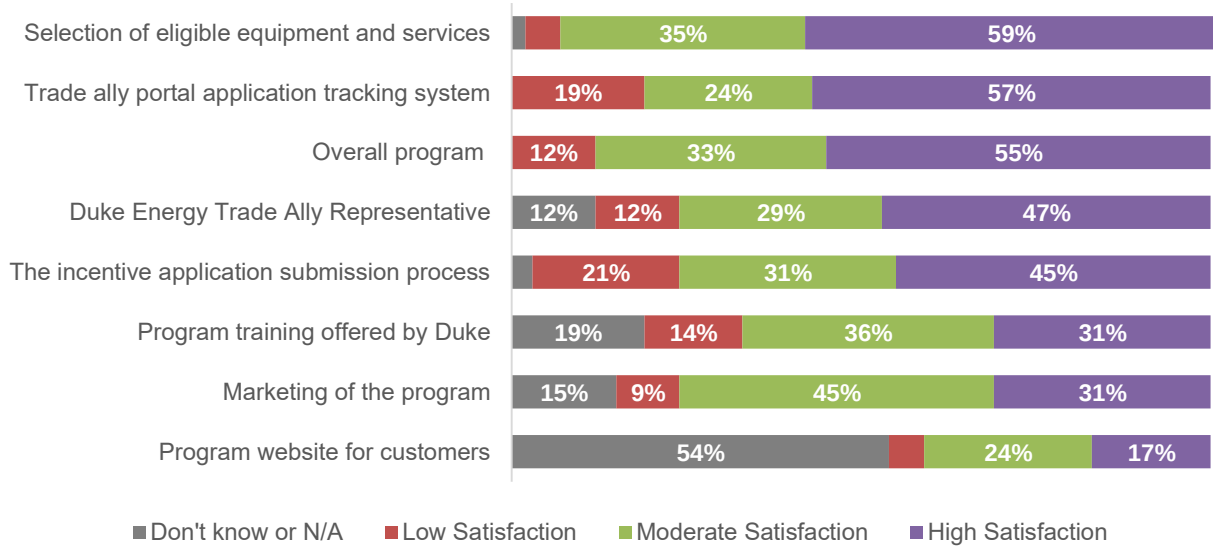
*Primary components of the Duke Energy Quality Install checklist

When completing the quality installation checklist on Tier 2 and Tier 3 HVAC jobs, almost all (91%) trade allies reported they do not charge their customers extra on the invoice for the quality install process. Open-ended comments reveal trade allies are considerably frustrated with the quality install measure: almost three-quarters (71%) of trade allies said improvements were needed or offered criticisms about the 'lengthy and burdensome' process. Of those offering suggestions for improvement, common responses included eliminating the Tier 1 HVAC incentives or checklist altogether, reducing paperwork required for the quality install checklist to simplify the process, and compensating the contractors for their time completing the quality installation. Additional analysis revealed that the more experience the trade ally had with the measure, the less likely they were to criticize it. See Appendix C for full verbatim responses.

5.2.1.7 Satisfaction

Surveyed trade allies reported moderate satisfaction with several program elements (Figure 5-10). The incentive submission process and the application tracking system received the most dissatisfied ratings; dissatisfied trade allies elaborated they were dissatisfied with these items because the submission process is burdensome and rebate statuses are often inaccurate. Program training and DEC's marketing of the program also received low satisfaction ratings, with trade allies explaining they were not aware of their presence (that is, they felt program marketing and training opportunities were lacking). However, over half of trade allies reported high satisfaction with the selection of eligible equipment and services and the overall program.

Figure 5-10: Trade Ally Satisfaction with Program Elements* (n=58)



* Asked on a 0-10 scale, where 0 is "very dissatisfied," 5 is "neither satisfied nor dissatisfied," and 10 is "very satisfied." Figure exhibits percent with "high influence" ratings that range from 8 to 10.

5.2.1.8 Suggestions for Improvement

Despite their moderate satisfaction ratings, trade allies had few suggestions for program improvement, including:

- Continue improving and simplifying the online portal and incentive application process. Some trade allies offered specific suggestions to help streamline the process and enhance the accessibility of the portal, such as eliminating highly technical jargon, reducing unnecessary paperwork, and other general usability improvements.
- Simplify or eliminate the quality installation process. Most trade allies offered suggestions for improving the checklist, including: eliminating the Tier 1 QI requirement or checklist altogether, compensating the trade ally for their time completing the checklist, and reducing the amount of paperwork needed to shorten the processing time.
- Improve communication and customer service. Although almost half of trade allies reported high satisfaction with their trade ally representative, over 40% of trade allies reported low to moderate satisfaction due to lack of communication and accessibility.

5.2.2 Participant Experience

In July 2017, the evaluation team surveyed 73 Smart $aver participants who received rebates through the program. Nearly all (95%) reported living at the residence where the work was performed, all of which reported owning their home. Nearly all (89%) reported living in a single-family detached home, followed by 6% living in a row or town house, 3% living in a factory manufactured single-family home, 1% living in a duplex, and 1% living in an apartment or condo building with four or more units (Table 5-8).

Table 5-8: Participant Housing Type

Housing Type	n=73
Single-family detached home	89%
Row house or town house	6%
Factory manufactured single-family home	3%
Duplex	1%
Apartment or condo building with four or more units	1%
Total	**100%**

5.2.2.1 Participant Awareness

Trade allies are the primary way consumers learn about the program, as evidenced by more than three-quarters (77%) of participants citing their contractor as their source of program awareness (Table 5-9). A minority of participants may have heard about Smart $aver via Duke Energy's marketing efforts, as several participants said they learned about the program from the internet (11%) or a mailer (8%).

Table 5-9: Source of $mart Saver Program Awareness (Multiple Responses Allowed)

Source of Program Awareness	n=73
Trade ally	77%
Online	11%
Mailer	8%
Duke Energy mentioned	6%
Don't know	6%
Other	6%

Respondents typically reported learning about energy efficient technologies from the internet, with about half (48%) of surveyed participants reporting going online to search for information regarding energy savings (Table 5-10). However, nearly one-quarter (22%) reported they do not typically search for information on how to save energy in their home.

Table 5-10: Source of Energy Savings Information (Multiple Responses Allowed)

Source of Energy Savings Information	n=73
Online sources	48%
Read utility information on how to save money	29%
Go to utility website	25%
In-store salespeople	1%
Other	5%
Not applicable – do not typically search for information on how to save energy	22%
Don't know	1%

5.2.2.2 Motivation to Participate

The evaluation team asked participants a series of questions to determine why they selected qualifying Smart $aver measures. For those participants who installed equipment measures, the evaluation team asked about the condition of the previous equipment they replaced, and then asked why they chose an energy efficient version of that equipment.

Overall, a slight majority (60%) of participants reported replacing their equipment because it was "getting old" (Table 5-11). More than half (55%) replaced their equipment because it was broken or not working properly, and 3% did so even though it was in good working condition.

Table 5-11: Condition of Previous HVAC Equipment

Condition of Previous System	Geothermal HP participant (n=1)	CAC participant (n=33)	ASHP participant (n=29)	Total (n=63)
Broken & old	0	6	8	14 (22%)
Old & working	0	0	0	0 (0%)
Working [only response]	0	0	2	2 (3%)
Old [only response]	1	19	4	24 (38%)
Broken [only response]	0	8	13	21 (33%)
Other	0	0	2	2 (3%)
No response	0	0	0	0 (0%)

*n=63 includes participants that installed the following: air source heat pump, geothermal heat pump, OR central air conditioner.

The most commonly reported motivation for selecting highly efficient HVAC equipment over standard efficiency equipment was some form of monetary savings (52%), followed by wanting to take advantage of the cost savings and return on investment (26%) and a desire to consume less energy (18%) as summarized in Table 5-12.

Table 5-12: Motivation for Installing Energy Efficient HVAC Equipment (Multiple Responses Allowed)

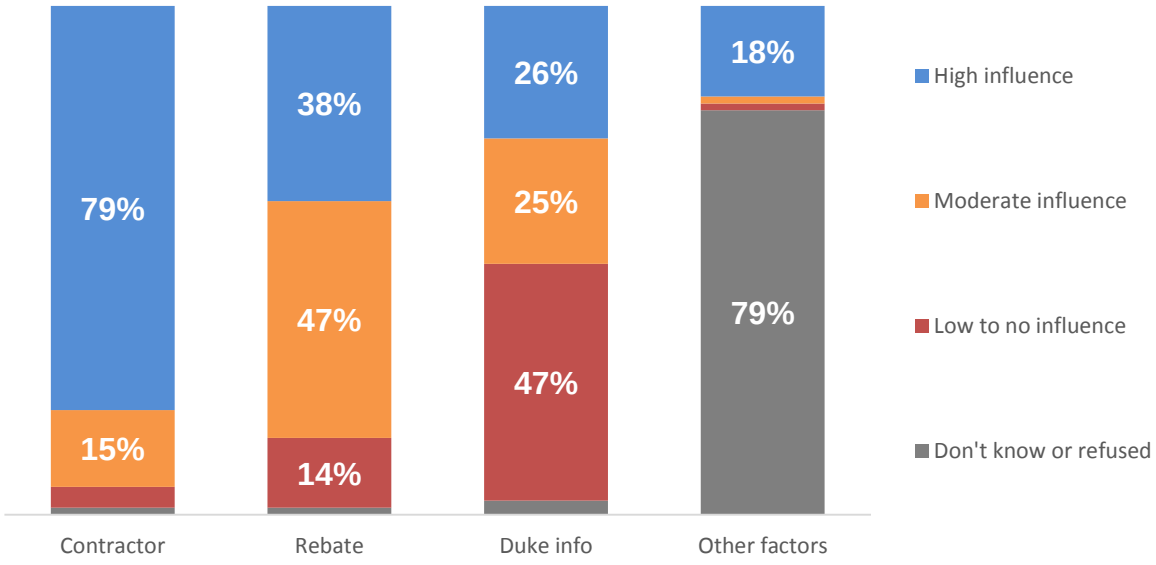
Motivations	n=63
Monetary savings*	52%
ROI & savings on energy bill	26%
To use less energy / make home more energy efficient	18%
To help the environment	8%
Interested in incentive / helped justify increased cost	8%
Wanted a quality system with low maintenance	3%
Contractor recommendation	5%
Other	3%

*Unclear if respondent is citing long term or upfront savings.

5.2.2.3 Program Influence

More than half (55%) of participants who purchased energy efficient equipment reported that recommendations from their contractor were highly influential in their decision to participate in the program (Figure 5-11). Contractors were much more influential than the Smart $aver rebate, information, or advertisements. Other influential factors included recommendations from friends or family, increasing value of home for sale, or federal tax credits.

Figure 5-11: Influential Factors in Decision to Purchase Efficient Measures* (n=73)



* Participants were asked to rate each factor using a 0 to 10 scale where 0 meant "not at all influential," and 10 meant "extremely influential." Low influence represents responses ranging from 0 to 3, moderate influence represents responses ranging from 4 to 7, and high influence represents responses ranging from 8 to 10. This only includes influence of these factors on participants' decision to purchase a primary measure, not add-on measures (smart thermostats or quality installation). For more information on influence on add-on measures, see section 5.2.2.5.

Nearly one-third (30%, or 22 of 73) of participants reported being familiar with other DEC energy efficiency programs (Table 5-13). Participants were most aware of the HVAC rebates (6 mentions). Among the 22 respondents that were aware of other DEC rebates, nine reported receiving one or more of them.

Table 5-13: Awareness and Participation in Other Duke Energy Programs (Multiple Responses Allowed)

	Count Aware (n=73)
Familiar with Other Duke Energy Rebates	22
Other Smart $aver Rebates	8
HVAC	*6*
Heat pump water heater	*2*
Pool pump	*2*
Attic insulation and air seal	*1*
Duct sealing and insulation	*1*
Smart Thermostat	*1*
Other Duke Energy Rebates	14
Discounted efficient lighting	*8*
In-home energy audit	*2*
Power manager	*1*
Other	*2*

Around one-third (30%) of participants reported purchasing other products or services to help save energy in their homes. However, very little of this resulted in attributable spillover savings as most (73%) said Smart $aver had no influence on their subsequent energy upgrades.

5.2.2.4 Participant Experience with the Program

About one-sixth (15%, or 11 of 71) of surveyed participants reported they contacted program staff with questions during the course of participating in the program. Of the 11 participants that contacted program staff, most (7 of 11) contacted them just once. Furthermore, of those participants who contacted staff, the majority (10 of 11) reported doing so via phone (Table 5-14).

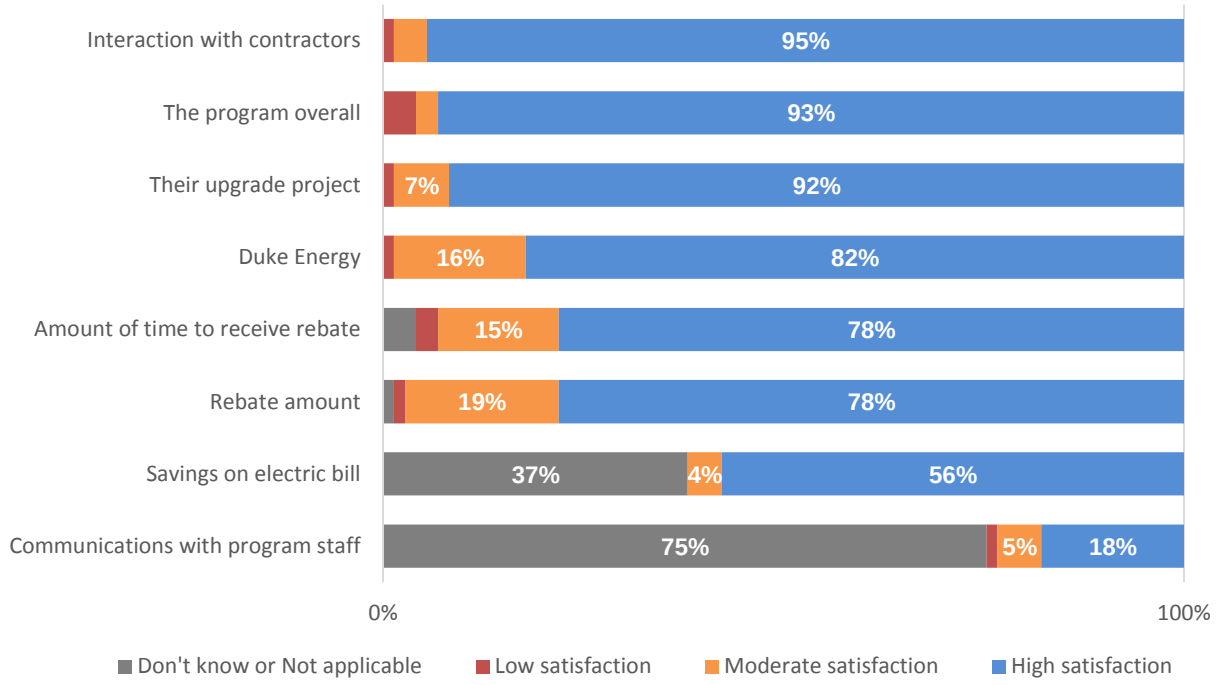
Table 5-14: Contact with Program Staff (n=73)

Contact with Program Staff	Count	Percent
Frequency of Contact		
Never	55	75%
Once	11	15%
Two or three times	6	8%
Four times or more	1	1%
Total	**73**	**100%**
Contact Type (Multiple Responses Allowed; n=18)*		
Phone	18	100%
Email	1	5%

* Includes those that indicated they contacted program staff at least once.

The majority of participants reported high satisfaction levels with most program elements (Figure 5-12). Nearly all (95%) reported being highly satisfied with their interaction with contractor. Furthermore, most participants reported being highly satisfied with their overall experience (93%) and results of their upgrade project (92%). Participants were comparably less satisfied with the rebate amount, and the amount of time to receive their rebate. Few participants noticed savings on their bill or interacted with program staff, but those who did tended to be highly satisfied.

Figure 5-12: Participant Satisfaction with Program Elements* (n=73)



* Participants were asked to rate each factor using a 0 to 10 scale where 0 meant "not at all satisfied," 5 meant "neither satisfied nor dissatisfied," and 10 meant "very satisfied." Low satisfaction represents responses ranging from 0 to 3, moderate satisfaction represents responses ranging from 4 to 7, and high satisfaction represents responses ranging from 8 to 10.

* For this item, participants were asked to rate their overall satisfaction on a five-point scale, from "very dissatisfied" to "very satisfied." The Evaluation Team recoded responses to be comparable with other items in the series.

To further understand Smart $aver's effect on participants attitudes towards Duke Energy, the evaluation team asked whether their participation in the program had a positive, neutral, or negative effect on their overall satisfaction with Duke Energy. Overall, participation was beneficial, with the majority (84%) of respondents reporting a positive effect, and just 1% reporting a negative effect (Table 5-15).

Table 5-15: Effect of $mart Saver Program on Participants Satisfaction with Duke Energy

Effect of Program on Satisfaction with Duke Energy	n=73
Positive effect	84%
No effect	15%
Negative effect	1%
Total	**100%**

Although savings were not a driving factor for participants' program satisfaction, the majority (62%) reported noticing savings on their electric bill since their last project was completed (Table 5-16).

Table 5-16: Resulting Energy Savings on Electric Bill

Experienced Savings on Electric Bill	n=73
Yes, they noticed savings	62%
No - they looked but did not notice any savings	10%
No - they looked but it is too soon to tell	4%
They didn't look	14%
Don't know	11%
Total	**100%**

The evaluation team asked all respondents if they had any suggestions to improve the program. Among the 24 participants who provided a response, around one-quarter (6 of 324) reported wanting more customer outreach to increase awareness of the program (Table 5-17). An additional five respondents suggested improving the program description and instructions around how to receive the rebate.

Table 5-17: Suggestions for Improving $mart Saver Program (Multiple Responses Allowed)

Suggestions for Improving the Program	Count (n=24)
Raise awareness, perform more outreach	6
Improve program description/Instructions on how to get rebate	5
Expand rebates / offerings	5
Improve customer service	1
Use a check for rebates rather than gift card	2
Other	6

5.2.2.5 New HVAC Incentives

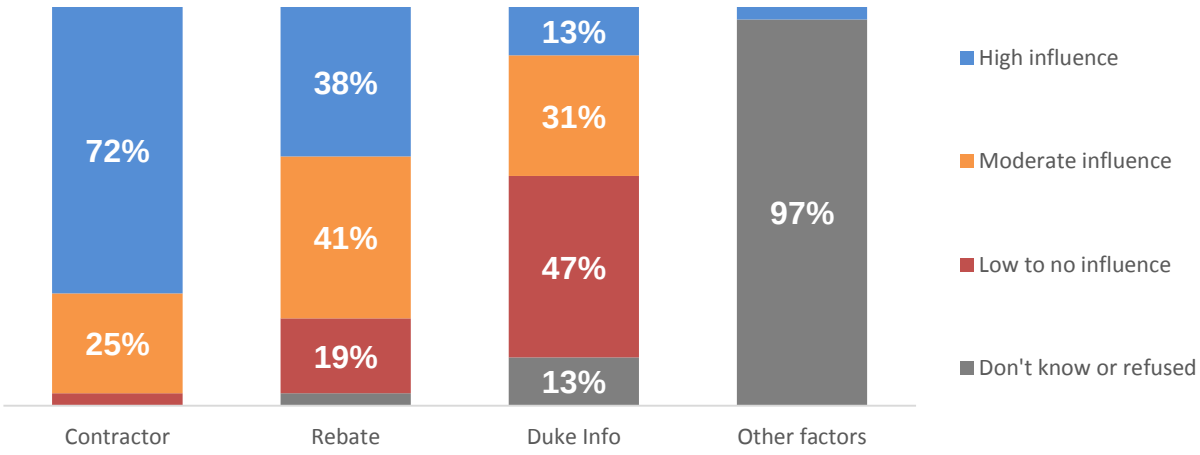
Most (97%) smart thermostat participants replaced non-programmable (50%) or standard programmable (47%) thermostats. Participants were motivated to replace their old thermostats with smart thermostats primarily because it was a 'package deal' and they liked the features (Table 5-18).

Table 5-18: Participant Motivations for Installing Smart Thermostats (Multiple Responses Allowed)

Motivations	(n=32)
Came as a package deal	47%
Thermostat features	38%
Convenience	9%
Rebate	9%
Don't know	6%

Nearly three quarters (72%) of participants that received a smart thermostat reported that recommendations from their contractor were highly influential in their decision to participate in the program (Figure 5-13). Participants rated their contractor as significantly more influential than the Smart $aver rebate or DEC information on their decision to purchase a smart thermostat.

Figure 5-13: Influence on Decision to Purchase a Smart Thermostat (n=32)



Most (75%) quality install rebate recipients were not aware that they had received a rebate for the service. Of those that were aware of the rebate, most (6 of 7) said their contractors gave them a choice between a standard installation and quality installation and most (5 of 7) had heard of quality install before receiving the service. However, the quality install rebate had little influence on participant purchase decisions among those that were aware that they received the rebate for the quality installation service: most (6 of 7) said that if Duke had not offered a rebate for the service, they still would have demanded their contractor provide a quality installation even if they would have had to pay extra for the service.

6 Conclusions and Recommendations

Based on evaluation findings, the evaluation team concluded the following and provides several suggestions on how to improve the program:

Conclusion 1: Trade allies are the driving force of the program, but there may be opportunities to improve their program experience and effectiveness. Trade allies are the primary mechanism for bringing participants into the program, as they often upsell energy efficient systems to customers who have no prior awareness of the program during a time of immediate heating or cooling needs. However, trade ally satisfaction with certain program elements is relatively low, particularly: the application process and portal, program training, and the quality installation process and requirements.

Recommendation: Look for ways to increase trade ally satisfaction and rebate volumes. Trade allies are vital to the program's success. DEC should work with Blackhawk Engagement Solutions, the program implementer, to improve the trade ally experience and look for ways to increase trade ally effectiveness in the field.

- Potential strategies for increasing trade ally effectiveness (and simultaneously increasing trade ally satisfaction):
- Provide marketing materials to trade allies, such as co-op marketing
- Attempt to increase trade ally participation in training events. Potential strategies:
  - Align training offerings with trade ally content requests, particularly: sales, quality install, portal/application process, and program changes
  - Ensure training sessions occur during convenient periods during the year (i.e., non-peak seasons) and convenient times (breakfast meetings can be particularly successful).
- Potential strategies for improving TA (Trade Ally) satisfaction:
  - Continue improving portal system and simplifying the application process
  - Consider splitting incentives with TAs to compensate TAs for their time spent on Duke Energy processes. Shifting a small portion of the incentive to the trade ally is unlikely to negatively impact participation levels, as participants were only marginally influenced by the rebate and were instead mainly influenced by their contractor's recommendation (a finding which underscores the need to retain a strong trade ally network).

Conclusion 2: Approximately 60% of sampled quality install sheets included issues. Trade allies complete quality install sheets detailing system measurements taken while on site. Upon review of a sample of quality install sheets, the evaluation team found several issues including:

- Math errors
- Calculated capacities below program requirement
- Rule of thumb CFM estimates instead of actual measurements
- Testing in sub-optimal conditions

These issues compromise the validity of the impact of quality installation and therefore the associated energy and demand savings cannot be verified.

- **Recommendations:**
  - Establish additional internal QA/QC processes when reviewing submitted quality install sheets.
  - Work with trade allies to better understand issues encountered with the quality install sheets and to improve quality install reporting.

Conclusion 3: The quality installation measure may have experienced some growing pains in its infancy. Many trade allies expressed frustration with the 'complex and time consuming' quality install form, especially since they receive no compensation for completing it. These concerns may have limited the initial growth of the new measure:

- Tier 1 (which requires QI) was the least installed HVAC tier, amounting to about one-tenth of all HVAC units in the program.
- Less than one-third of Tier 2 and Tier 3 HVAC units received a QI rebate.
  - **Recommendation: As DEC matures the quality installation measure, look for ways to retain, expand, and improve trade ally quality install practices.**
  - Potential strategies for retaining and expanding trade ally quality installation practices:
    - Shift the quality install rebate to trade allies: trade ally dissatisfaction with the process may be mitigated by compensation.
    - Hold a round table meeting with trade allies to collaborate on a revised quality install process that better serves the needs of both parties: for DEC to generate cost-effective savings from the measure, the process must be minimally burdensome for trade allies so that they actively and accurately complete it

Conclusion 4: New HVAC rebates and requirements are generating additional energy savings that would not have occurred naturally. The new HVAC program components have resulted in increased trade ally sales of high SEER HVAC units and smart thermostats. Although comparatively less successful, quality installation rebates and requirements have encouraged a minority of trade allies to adopt new quality install techniques.

- **Recommendation 1:** Continue offering the new incentives:
  - tiered HVAC incentives
  - smart thermostats incentives
  - QI incentives (however, shift the rebate to trade allies)
- **Recommendation 2:** Continue looking for new program offerings that could generate additional savings

Appendix A Summary Form

Smart $aver Program

Completed EMV Fact Sheet

Description of program

The Smart $aver program offers Duke Energy existing residential customers incentives for improving their home's energy efficiency through the installation of energy efficient heating, ventilating, and air conditioning (HVAC), quality installation of HVAC units, smart thermostats, pool pump, and water heating equipment replacements, duct sealing, duct insulation, and attic insulation with air sealing.

Date	May1, 2016 – April 30, 2017	Measure	Verified Net Savings (kWh)
Region(s)	Carolinas	Central Air Conditioner	150
Evaluation Period	May 1, 2016 – April 30, 2017	Air Source Heat Pump	318
Annual kWh Net Savings	5,308,068	Geothermal Heat Pump	1,758
Coincident kW Net Impact - Summer	1,385	Quality Installation	9
Coincident kW Net Impact - Winter	1,665	Smart Thermostat	227
Net-to-Gross Ratio	66.7%	Attic Insulation & Air Seal	549
Process Evaluation	Yes	Variable Speed Pool Pump	1,621
Previous Evaluation(s)	N/A	Heat Pump Water Heater	1,078
		Duct Sealing	292
		Duct Insulation	423

Evaluation Methodology

Impact Evaluation Activities

- *44 on-site metered systems*
- *73 telephone surveys with participants*

Impact Evaluation Findings

- *Realization rate: 83.0%*
- *Net-to-gross: 66.7%*

Process Evaluation Activities

- *Program and implementation staff: interviews with one program staff and one implementation staff*
- *Trade Allies; 5 interviews with high volume contractors, surveys with a representative sample of 58 trade allies*
- *Participants; 73 telephone surveys of participating households.*

Process Evaluation Findings

- *Participants are highly satisfied with Smart $aver.*
- *Smart $aver influences energy efficiency contracting services.*
- *Trade allies are Smart $aver's most successful marketing channel.*
- *Trade ally satisfaction is moderately low, particularly with: portal/application process and quality install process*

Appendix B Measure Impact Results

Table B-1 Program Year 2016 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Summer Coincident Demand per unit (kW)	Gross Winter Coincident Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio	Measure Life
Central Air Conditioner	225	0.123	0.167	0.38	0.05	0.67	18
Heat Pump	490	0.149	0.213				18
Quality Install	13	0.005	0.004				10
Smart Thermostat	340	0.000	0.000				11
Attic Insulation & Air Seal	824	0.221	0.399				20
Variable Speed Pool Pump	2,430	0.527	0.000				10
Heat Pump Water Heater	1,616	0.000	0.000				10
Duct Sealing	438	0.162	0.153				18
Duct Insulation	634	0.234	0.222				20

Appendix C Survey Instruments

C.1 Trade Ally In Depth Interview

Introduction

Hi, I'm ____ calling from Research Into Action on behalf of Duke Energy Carolinas. We are evaluating the SMART $AVER program and we are looking to speak with contractors like yourself who have been particularly active in the program. Our program records indicate that your firm completed several projects this year for which a customer received an incentive from Duke Energy Carolinas SMART $AVER program, is that correct? And are you knowledgeable about those incented projects?

[If "no," ask to speak to someone who is knowledgeable about SMART $AVER work]

Your participation in this study is very important to Duke Energy Carolinas – this is your chance to tell us what is working well, what isn't, and how Duke Energy Carolinas can improve the program to better serve you and your customers. Do you have time to speak on the phone with me today about your experiences in the program?

Great. Rest assured, your answers will be kept strictly confidential and will not be tied to you or your firm. Is it okay if I record our conversation for note keeping purposes? [IF NEEDED: It is just so I can go back and clean up my notes after we are done talking, as to ensure I accurately captured everything you said.]

Background

Q1. My records show your company provides [PIPE IN SERVICES OFFERED: HVAC, plumbing, shell] services through SMART $AVER. Is that correct?

Q2. Have you completed any **new construction** projects that received incentives from the Smart Saver program?

Awareness and Engagement

Q3. How do you explain the value of energy efficiency upgrades to your customers? What are some successful strategies?

Q4. [ASK IF INSTALLED HVAC] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers replace their HVAC equipment?

[ASK IF INSTALLED HPWH] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers replace their water heaters?

[ASK IF INSTALLED POOL PUMPS] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers install ENERGY STAR efficient pool pumps that are equipped with variable speed drives? What proportion of efficient pool pump sales are replacing used pool pumps (as compared to pool pumps that go into newly constructed pools)?

[ASK IF INSTALLED ATTIC/DUCT INSULATION] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers insulate and seal their attics and ducts?

Q5. How did your company learn about the SMART $AVER program?

Q6. About what proportion of your SMART $AVER customers knew about the program prior to you mentioning it? [IF NEEDED: about what proportion of your SMART $AVER customers requested SMART $AVER rebates before you had a chance to mention them?]

Q7. Duke Energy conducts various marketing efforts to promote the SMART $AVER program to your customers. Would you say the program has the right amount, too much, or too little marketing?

Q8. How do you think Duke Energy Carolinas could improve their marketing and outreach efforts?

Q9. What does your company do to market the SMART $AVER program?

Q10. How can Duke better support your SMART $AVER marketing efforts?

Q11. Have you attended any orientations or training events from Duke Energy Carolinas? If yes: What events did you attend? Did the training provide you with information you found useful? Is there anything that you wish had been discussed in the training, but was not?

Q12. Would you like additional training opportunities to help your team more effectively sell rebated equipment? [*Probe: What type of training: sales/marketing training?*]

Q13. Tell me about your thoughts and experiences with the new online application system. (How has it improved or worsened the application process?)

Q14. Do you ever use the program's online portal for contractors for reasons other than submitting rebate applications? If so, for what? Is it helpful? Could it use improvement?

Q15. A new company, Blackhawk Engagement Solutions, is implementing the program now (they take care of rebate application processing, fulfillment and the program call center). How has this affected your experience in the program, if at all?

Q16. How satisfied are you with your Duke Energy Trade Ally Representative? (IF NEEDED: Please explain why you said that)

Trade Ally Program Experience

Q17. What are the challenges you've experienced in the program?

Probes:

- QA audit process (common fails? QA process is cumbersome?)
- Variety of measures offered
- Customer participation rates
- Rebate application process
- Delays
- Communications with Duke Energy and implementer
- Other

Q18. Do you have any suggestions on how to improve the program process?

Program Satisfaction

Q19. What do you like best about the program?

Q20. What do you like least about the program?

Market Changes

Q21. What new energy efficient technologies do you see taking off in the near future? What are your customers asking for? Are there any energy efficient technologies you think would sell better if Duke offered incentives for them? If so, what?

HVAC Offerings [ASK IF HVAC CONTRACTOR]

As you may know, Duke Energy offers additional rebates for HVAC rebate customers who also install smart thermostats that connect to the internet.

Q22. Has this rebate affected the number of smart thermostats you install each year? If so, by how much?

Q23. How, if at all, has the smart thermostat rebate influenced you to recommend smart thermostats to your customers?

Q24. Do you think the smart thermostat rebate has any influence on a consumer's decision to replace their HVAC system?

Duke Energy now offers higher rebates for central air-conditioners and heat pumps that are above SEER 16.

Q25. Thinking of these higher incentives, how, if at all, have they helped you sell more central air-conditioners that are above SEER 16?

Q26. How, if at all, have the higher incentives helped you sell more air-source heat pumps that are above SEER 16?

Q27. Duke Energy also now offers higher rebates for "quality installs" of central air-conditioners and heat pumps. [IF NEEDED: On qualified HVAC replacement, a quality install checklist must be performed to ensure 90 percent net capacity has been achieved at time of installation as rated by AHRI.].

a) Have you done any quality install rebate projects yet?

b) How, if it all, has the "quality install" rebate changed the way you install heat pumps and air conditioners?

c) What kind of metrics were you using previously to verify the system was correctly installed? (static pressure, rated capacity for system, etc.?)

d) How did you all internally document quality installation metrics before the program provided the checklist?

Q28. How, if at all, has the "quality install" rebate changed the way you install air conditioners?

Closing

Q49. Thanks so much for your time today. Are there any other comments you would like to provide?

C.2 Trade Ally Survey

Introduction

Hi, I'm ____ calling from Nexant on behalf of Duke Energy. May I speak with whomever is most knowledgeable about the rebated [MEASURE LIST] that your firm has installed through the Duke Energy Smart Saver rebate program?

[*If needed*:] I need to speak with someone who is knowledgeable about the sales and installation process – which is typically an installer or sales person]

[*Once appropriate contact is one phone*]

We want to get some feedback on how the Smart $aver Duke Energy program is working for your firm - this is your chance to tell us what is working well, what isn't, and how Duke Energy can improve the program to better serve you and your customers. Is this a good time to talk?

[*If needed*:]

- The survey takes about 15 minutes, depending on how much we have to discuss.
- If now isn't a good time, when could I call you back?

Please note that this call may be monitored or recorded for quality assurance purposes. Rest assured, your answers will be confidential and not tied to you or your firm.

Screening [Ask All]

[Base: All respondents]

S1. How many locations does your company have?

1. One
2. Two
3. Three
4. Four
5. Five
6. More than five [*Interviewer, make sure to record the exact number of locations if this option is checked*:] _____
98. Don't Know
99. Refusal

[ASK IF S1>1]

S2. We would like to talk today about the projects that were sold and installed by the [**PIPE IN ADDRESS**] location. Are you able to speak to the work associated with that location?

1. YES [CONTINUE]
2. NO [*Ask to speak with alternative appropriate person*]
98. Don't know [*Ask to speak with alternative appropriate person*]
99. Refused [*Thank and terminate*]

[*Read preface to all*:] Please note when I mention Duke I am referring only to Duke Energy Carolinas.

S3. Does your firm primarily focus on new construction or existing home projects?

1. New construction projects [*Thank and terminate*]
2. Existing homes
3. Both

98. Don't know [*Ask to speak with alternative appropriate person*]
99. Refused [*Thank and terminate, Record*]

Sources of Program Awareness

[Base: All respondents]

Q1. How did you first hear about Duke Energy Smart $aver rebate offers for HVAC equipment, variable speed pool pumps, insulation, and duct sealing?

1. Word-of-mouth (co-worker, another contractor)
2. Duke Energy website
3. Duke Energy program representative
4. TV/Radio/Newspaper/Billboard Ad
5. Event (home show, workshop, etc.)
6. Other, please specify: _____
98. Don't know
99. Refused

Nonparticipant Spillover

[*READ PREFACE TO ALL*:]

Next, I will ask you some questions about the work your company did last year in Duke Energy territory, which is separate from Duke Energy Progress territory. When answering these questions, please only consider your work in Duke Energy territory, which includes communities in western North Carolina and the Northwestern parts of South Carolina.

[IF 0>1, DISPLAY:] [*Interviewer read*:] Remember, please only consider projects associated with the [**PIPE IN ADDRESS**] location when answering questions.

[START LOOP – LOOP THROUGH TOP THREE MOST INSTALLED MEASURE TYPES THAT TRADE ALLIES INSTALLED SINCE APRIL OF 2016]

[Base: All respondents]

Q2. Since August of 2016, about what proportion of the [**MEASURE**] jobs that your company did in Duke territory would have qualified for a Duke rebate? [If needed: Your best estimate is fine.] [*Interviewers: Record a number. if they give a range, record a mid-point of that range. For example, if they say 80 to 90%, input 85%.*]

1. [Record response]

[*Do not read*:]

98. Don't Know
99. Refused

[Base: All respondents]

Q3. And since August 2016, what percent of all your Duke rebate qualified [MEASURE] projects did you actually apply for a rebate? [If needed: Your best estimate is fine.] *[Interviewers: Record a number. if they give a range, record a mid-point of that range. For example, if they say 80 to 90%, input 85%.*]

1. [Record response]

[*Do not read*:]

98. Don't Know
99. Refused

Q4. About what proportion of your rebate qualifying [**MEASURE**] customers specifically requested the [**MEASURE**] on their own and were not influenced by your recommendation? [If needed: Your best estimate is fine.]

1. [*Record percent*]

[*Do not read*:]

98. Don't Know
99. Refused

Q5. Using a 0 to 10 scale, where 0 is "not at all influential" and 10 is "extremely influential," how much influence has the Duke program had on your business practice of recommending rebate qualifying [**MEASURE**] to your customers?

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don't Know
99.	Refused

[END LOOP]

Program Influence and Effects on TAs

[BASE: TRADE ALLIES THAT INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS]

Q6. Thinking back to before you were involved in the Duke Energy program, how often did you recommend higher efficiency equipment that uses less energy than standard models to your customers? Would you say none of the time, some of the time, most of the time, or every time?

[SINGLE RESPONSE]

1. None of the time
2. Some of the time
3. Most of the time
4. Every time
97. Not applicable – I've been involved with the Duke program since starting in the industry/this company
98. Don't know
99. Refused

[BASE: TRADE ALLIES THAT INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS]

Q7. And what about now? [*If needed:* Currently, how often do you recommend higher efficiency equipment that uses less energy than standard models to your customers? Would you say none of the time, some of the time, most of the time, or every time?]

[SINGLE RESPONSE. DO NOT READ]

1. None of the time
2. Some of the time
3. Most of the time
4. Every time
98. Don't know
99. Refused

[BASE: ALL RESPONDENTS]

Q8. Would you say your knowledge of energy efficient products and services has increased, decreased, or stayed about the same since you became involved with the program?

[SINGLE RESPONSE]

1. Increased
2. Decreased

3. Stayed about the same
98. Don't know
99. Refused

[ASK IF Q8 =1]

Q9. Using a 0 to 10 scale, where 0 is “not at all influential” and 10 is “extremely influential,” how much influence has Duke Energy program had on your increased knowledge of energy efficient products and services?

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don’t Know
99.	Refused

Code Changes

[READ PREFACE IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS OR AIR SOURCE HEAT PUMPS]

As you may know, a new code for air conditioners and air source heat pumps was enforced in 2015 – the minimum SEER went from 13 to 14.

[Base: IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS]

Q10. How much more difficult or easier is it to sell 15 SEER central air conditioners now that the code is 14 SEER? Would you say it is: [READ FIRST FIVE RESPONSE OPTIONS:]

1. Much more difficult
2. Somewhat more difficult
3. No different
4. Somewhat easier
5. Much easier

[*Do not read*:]

97. Do not sell SEER 15
98. Don't know
99. Refused

[Base: IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS]

Q11. How much more difficult or easier is it to sell 15 SEER HVAC heat pumps now that the code is 14 SEER? Would you say it is:

[*Read*:]

1. Much more difficult
2. Somewhat more difficult
3. No different
4. Somewhat easier
5. Much easier

[*Do not read*:]

97. Do not sell SEER 15
98. Don't know
99. Refused

New Incentives

[Base: IF CONTRACTOR INSTALLED SMART THERMOSTATS]

Q12. As you may know, Duke Energy offers a rebate for smart thermostats. By how much did your installations of smart thermostats increase since Duke began offering smart thermostat rebates? Would you say…

[*Read*:]

1. No increase
2. Some increase
3. A large increase

[*Do not read*:]

98. Don't know
99. Refused

[Base: IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS OR AIR SOURCE HEAT PUMPS]

[*Before asking Q13 and Q14, read*:] As you also may know, Duke Energy started to offer higher rebates for central air-conditioners and heat pumps that are above 14 SEER.

[Base: IF INSTALLED CACS]

Q13. Thinking of these higher incentives, did those help you sell more central air-conditioners that are 15 SEER or higher?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF INSTALLED AIR SOURCE HEAT PUMPS]

Q14. Thinking of these higher incentives, did those help you sell more air-source heat pumps that are 15 SEER or higher?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF PERFORMED QUALITY INSTALLS]

Q15. As you may know, Duke Energy recently added “quality install” requirements for installations of heat pumps and air conditioners? Were you already doing all the techniques on the quality install check list prior to Duke requiring them?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]

Q16. Prior to using Duke’s quality install checklist, did you have a system in place to document that your installers were following these same quality install techniques?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]

Q17. Prior to using Duke’s quality install checklist, what specific quality install techniques were you using? Please be as specific as possible.

[*Multiple response, do not read*:]

1. System capacity
2. Airflow / static pressure
3. System CFM (cubic feet per minute)
4. Condenser measurements
5. Enthalpy conversion
6. Blower door tests
7. Duct blaster tests
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[Base: IF PERFORMED QUALITY INSTALLS ON TIER 2 OR TIER 3 HVAC MEASURES]

Q18. I have a question about your Duke Energy tier 2 and tier 3 HVAC jobs – these are the ones where the quality installation check list is not required, so quality installations get the customer an additional $60 rebate. Do you charge your customers extra on the invoice for completing the quality installation rebate checklist on tier 2 and tier 3 HVAC jobs?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF PERFORMED QUALITY INSTALLS]

Q19. Do you have any suggestions on how Duke Energy could improve the quality install requirements?

1. [*Record response*]
98. Don't know
99. Refused

Challenges and Suggestions for Improvement

[Base: All respondents]

Q20. What energy efficient products, technologies, or services should be added to the Duke Energy Progress rebate program? [*Do not read: Choose all that apply*.] [MULTIPLE RESPONSE]

1. Modulating furnaces
2. Heat recovery ventilation (HRV) systems
3. Boilers
4. Furnaces equipped with electronically commutated motor (ECM) furnaces

5. Tankless water heaters
6. Humidifiers
7. Air handlers
8. Windows
9. Doors
10. No others should be added
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[Base: All respondents]

Q21. Have you attended any orientations or training events from Duke Energy Carolinas?

1. Yes
2. No
98. Don't know
99. Refused

[BASE: IF Q21=1]

Q22. What topics were covered in the last Duke Energy event you attended?

1. [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[BASE: IF Q21=1]

Q23. On a scale from 0 to 10, where 0 is “not at all helpful” and 10 is “extremely helpful,” how helpful was the last Duke Energy event you attended?

1. Yes
2. No
98. Don't know
99. Refused

[Base: All respondents]

Q24. What types of training, if any, would you be interested in receiving from Duke Energy?

1. [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[Base: All respondents]

Q25. On a scale from 0 to 10, where 0 is “not at all interested” and 10 is “extremely interested,” how interested would you be in a training course on how to more effectively sell high efficiency equipment to your customers if it was offered by the program?

[SINGLE RESPONSE]

0.	0. Not all interested
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely interested
98.	Don’t Know
99.	Refused

[Base: All respondents]

Q26. How often do your customers ask about the Duke Energy rebates before you’ve had the chance to bring them up? Would you say…

[*Read*:]

1. Never
2. Rarely
3. Occasionally
4. Frequently, or
5. Always

[*Do not read*:]

98. Don’t Know
99. Refused

[Base: All respondents]

Q27. Since Duke transitioned to the online application system in April 2016, how frequently have you experienced problems or frustrations with the rebate application process? Would you say…

[*Read*:]

1. Never
2. Rarely
3. Occasionally
4. Frequently, or
5. Always

[*Do not read*:]

98. Don't Know
99. Refusal

[ASK IF Q27=2-5]

Q28. What types of problems or frustrations did you experience?

1. [*Record response*]

[*Do not read*:]

98. Don't Know
99. Refusal

[ASK IF Q27=2-5]

Q29. Overall, have these problems persisted or gotten better over time? Would you say these problems have:

[*Read*:]

1. Persisted
2. Gotten somewhat better, or
3. Have been completely resolved at this point

[*Do not read*:]

98. Don't Know
99. Refusal

[Base: All respondents]

Q30. Do you have any suggestions on how Duke Energy could improve the rebate application process?

1. [*Record response*]

98. Don't Know
99. Refusal

[Base: All respondents]

Q31. Do you have any suggestions on how Duke Energy could improve the project inspection process?

1. [*Record response*]

[*Do not read*:]

98. Don't Know
99. Refusal

Satisfaction

[Preamble:]

Thanks for your feedback so far, next I have some questions about your satisfaction with the program.

[Base: All respondents]

Q32. Please rate the extent to which you are satisfied with the following aspects of the program using a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied." How satisfied are you with:

A	Program training offered by Duke Energy
B	Your Duke Energy Trade Ally Representative
C	The program website for customers
D	The trade ally portal application tracking system
E	The marketing of the program
F	The incentive application submission process
G	The selection of eligible equipment and services
H	The overall program

[Single Response on Each A-H Item]

0.	0. Very dissatisfied
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[BASE: ASK IF Q32 < 5]

[**PROGRAMMER'S NOTE:** REPEAT Q33 FOR EACH STATEMENT FROM Q32 WHERE Q32<5]

Q33. Please explain why you were dissatisfied with [**INSERT STATEMENT FROM Q32 A-H**]:

1. [*Record response*]
98. Don't Know
99. Refusal

Closing

[Base: All respondents]

Q34. Thanks so much for your time today. Are there any other comments you would like to provide?

1. [*Record response*]

C.3 Participant Survey

Introduction

[*READ IF CONTACT NAME IS KNOWN:*] Hello, may I speak with _____. [*READ IF NAME IS UNKNOWN*] Hi, my name is _____from Nexant. I'm calling on behalf of Duke Energy. Our records show that you received a rebate for [**LIST ALL MEASURES**] from the Duke Energy Smart $aver Program.

[*INTERVIEWER – IF PERSON ON PHONE IS UNAWARE OF THE REBATED WORK, ASK TO SPEAK WITH SOMEONE IN THE HOME WHO MIGHT RECALL RECEIVING A REBATE FROM DUKE ENERGY.*

IF PERSON ON PHONE SAYS THEY ARE RENTER (AND/OR THEIR LANDLORD OR PROPERTY MANAGER WAS RESPONSIBLE FOR THE PROJECT), ASK FOR LANDLORD/PROPERTY MANAGER'S NAME AND PHONE NUMBER AND USE THAT AS THE NEW POINT OF CONTACT]

Duke Energy would like your feedback about the work that was done to the home/property through the program as well as feedback on your experience with the program. Is now a good time to talk?

[*IF NEEDED*]*:* The survey will take about 10 to 15 minutes, depending on the details you have for us.

[*IF NEEDED*: *SCHEDULE A TIME TO CALL THEM TO COMPLETE THE SURVEY*]

Please note that this call may be monitored or recorded for quality assurance purposes.

Building Type Confirmation

[ASK ALL]

Q1. I'm going to read a list of building types. Please stop me when I mention the building type that best describes the residence where this work was done. [*READ LIST*]

[SINGLE RESPONSE]

1. Single-family detached home [*IF NEEDED: NOT A DUPLEX, TOWNHOME, OR APARTMENT; ATTACHED GARAGE IS OK*]
2. Factory manufactured single family home
3. Row house or town house
4. Duplex
5. Triplex [*IF NEEDED: building with three units*]
6. Apartment or condo building with four or more units

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[PROGRAMMER: IF 0=1-2, BUILDING TYPE=SF. IF 0=3-6, BUILDING TYPE=OTHER. IF 0=96-99, USE PRE-CODED BUILDING TYPE FROM LIST]

Sources of Program Information

[ASK ALL]

Q2. How did you hear about the Duke Energy Smart $aver **rebate(s)** that you received? *[RECORD VERBATIM]*

[ASK ALL]

Q3. Are you familiar with other energy-efficiency rebates that Duke Energy offers, aside from the **[LIST ALL MEASURES THEY RECEIVED FROM SMART $SAVER PROGRAM]** rebate(s)?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF 0= 1 (Yes)]

Q4. Which other rebates are you familiar with? *[Do not read list]* [PROGRAMMER: EXCLUDE THE REBATES THAT THEY RECEIVED FROM THE LIST BELOW]

[MULTIPLE RESPONSE]

1. Heat pump water heater rebate
2. Heating and cooling system rebate
3. Geothermal heat pump rebate
4. Smart Wi-Fi enabled thermostat rebate
5. Attic Insulation and Air Seal rebate
6. Duct sealing and insulation rebate
7. In-home energy audit
8. Pool pump rebate
9. Power Manager bill discounts (for allowing Duke Energy to ramp down air-conditioning during peak usage events)
10. Discounted efficient lighting (CFLs, LEDs, and specialty bulbs)
11. Other – please specify: [OPEN-ENDED RESPONSE]
98. Don’t know
99. Refused

[ASK IF 0= 1 (Yes)]

Q5. Have you received any of these other rebates?

[SINGLE RESPONSE]

1. Yes
2. No

98. Don't know
99. Refused

[ASK IF 0= 1 (Yes) AND Q4 <>98 OR 99 AND MORE THAN ONE ITEM SELECTED IN 0; IF ONLY ONE ITEM SELECTED IN 0 (AND Q4 <>98 OR 99) AND 0=1, AUTOCODE 0 RESPONSE FOR 0]

Q6. Which rebate(s) did you receive? *[Do not read list]*

[MULTIPLE RESPONSE]

1. Heat pump water heater rebate
2. Heating and cooling system rebate
3. Geothermal heat pump rebate
4. Smart Wi-Fi enabled thermostat rebate
5. Attic Insulation and Air Seal rebate
6. Duct sealing/insulation rebate
7. In-home energy audit
8. Pool pump rebate
9. Power Manager bill discounts (for allowing Duke Energy to ramp down air-conditioning during peak usage events)
10. Discounted efficient lighting (CFLs, LEDs, and specialty bulbs)
11. Other – please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Program Influence

[ASK IF 0= 1 (Yes)]

Q7. Did you receive the [**Insert rebated measures from 0**] before or after [**PROJECT #1 LIST**] work was done? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN 0]

[SINGLE RESPONSE]

1. Before
2. After
3. Both before and after
4. At the same time
98. Don't know
99. Refused

[ASK IF 0= 2 or 3 (“After” or “Both before and after”)]

Q8. Using a scale from 0 to 10, where 0 means “Not at all influential” and 10 means “Extremely influential,” how influential was the rebate for [**PROJECT #1 LIST**] in your decision to take advantage of Duke Energy’s [**Insert response from 0**]? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN 0 WHERE RESPONSE TO 0=2 (“After”) OR 0=3 (“Both before and after”)]

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don't Know
99.	Refused

[ASK IF RESPONDENT HAS A **PROJECT #2 LIST**]

Q9. Using a scale from 0 to 10, where 0 means "Not at all influential" and 10 means "Extremely influential," how influential was the rebate for [**PROJECT #1 LIST**] in your decision to take advantage of additional Duke Energy rebates for [**PROJECT #2 LIST**]?

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don't Know
99.	Refused

Motivations

We'd like to know what motivated you to complete the work we've been talking about that was rebated through the Duke Energy Smart $aver Program.

[ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED]

Q10. [IF AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP WAS INSTALLED, READ:] Which of the following best describes the condition of the previous HVAC system that you replaced with a [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP**]?

[IF CENTRAL AIR CONDITIONER WAS INSTALLED, READ:] Which of the following best describes the condition of the previous air conditioner that you replaced?

[*READ* – MULTIPLE RESPONSE]

1. It was broken or malfunctioning
2. It was getting old, or
3. It was in good working condition

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q11. [ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED] Approximately, how many years old was the previous HVAC unit that you replaced with your new [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] [*RECORD VERBATIM*]

[ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP, HEAT PUMP WATER HEATER WAS INSTALLED]

Q12. What motivated you to install an **energy efficient** system rather than a less efficient one that would use more energy? [*RECORD VERBATIM*]

Q13. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] I'd like to know how you selected the specific make and model of the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] you purchased. Would you say that you chose it…

[READ LIST; SINGLE RESPONSE]

1. Yourself, based entirely on your own research?
2. From a list of options provided by the contractor?
3. Because it was the only option recommended by your contractor?

[*Do not read*:]

96. In some other way, please specify: [RECORD OPEN-ENDED RESPONSE]

98. Don't know
99. Refused

Q14. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] Suppose the contractor that installed your [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] did not offer high efficiency [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**]s that qualify for Duke rebates. Which of the following is most likely what you would have done? [*READ RESPONSE OPTIONS, SINGLE RESPONSE*]

1. You would have installed the cheaper less efficient unit that would not have qualified for rebates if that's all your contractor offered, or
2. You would have looked for a contractor that could install a rebate-qualified high efficiency unit

[*Do not read*:]
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q15. Which of the following best describes the old thermostat that you replaced?

[*READ* – SINGLE RESPONSE]

1. Manual non-programmable thermostat,
2. Programmable thermostat that <u>*does not*</u> communicate with your wi-fi network, or
3. Programmable thermostat that communicates with your wi-fi network

[*Do not read*:]
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q16. Thinking of your old thermostat, at what temperature was that thermostat typically set in the winter?

1. *Record temperature setting/response here*: _____
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q17. And what about your new wifi thermostat? At what temperature is the new thermostat typically set in the winter?

1. *Record temperature setting/response here*: _____
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q18. If you used your old thermostat to control air conditioning, at what temperature was your old thermostat typically set in the summer for air conditioning?

1. *Record temperature setting/response here*: _____
2. Did not use my old thermostat to control air conditioning
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED AND Q18<>2]

Q19. And what about your new wifi thermostat? At what temperature is the new thermostat typically set in the summer?

1. *Record temperature setting/response here*: _____
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q20. What motivated you to install a wi-fi enabled thermostat? [*RECORD VERBATIM*]

[ASK IF HVAC TIER = 2 OR 3, AND QUALITY INSTALL REBATE WAS RECEIVED]

Q21. Program records show that you received an additional $60 rebate for a quality installation from your contractor. This additional rebate was included on the VISA gift card you received in the mail from Duke Energy. This rebate was for additional work your contractor did to ensure that your new [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] was installed to run as efficiently as possible. Prior to today, were you aware that you received a quality installation rebate?

1. Yes
2. No

[*Do not read*:]

98. Don't know
99. Refused

[ASK IF Q21=1]

Q22. Prior to talking with the contractor that installed the [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**], were you aware of quality installation practices that ensure the [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] is installed to run as efficiently as possible?

1. Yes – I was already familiar with quality installation practices
2. No – I was not previously familiar with quality installation practices

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q21=1]

Q23. Did your contractor let you choose between a standard installation service that was not eligible for the additional rebate and a quality installation that would get you an additional rebate from Duke Energy?

1. Yes – they let me choose between standard and quality
2. No – they did not give me a choice

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED]

Q24. Which of the following best describes the condition of the previous water heater that you replaced?

[*READ* – MULTIPLE RESPONSE]

1. It was broken or malfunctioning
2. It was getting old, or
3. It was in good working condition

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q25. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Approximately, how many years old was the previous water heater that you replaced with your new heat pump water heater? [*RECORD VERBATIM*]

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED]

Q26. Where did you install your new heat pump water heater?

1. Garage
2. Basement
3. Closet
4. Laundry room

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED and IF Q26<>98 or 99]

Q27. Do you use your HVAC system to heat and cool the [PIPE IN ANSWER FROM Q26] where the heat pump water heater is located?

1. Yes
2. No

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q28. [ASK IF AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP WAS **NOT** INSTALLED] What type of system do you use to heat your home? [Multiple response allowed]

1. Heat pump
2. Electric baseboard heaters
3. Natural gas furnace
4. Plug in space heaters
5. Cadet wall heaters

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS **NOT** INSTALLED]

Q29. What type of system do you use to cool your home? [Multiple response allowed]

1. Central air conditioner
2. Heat pump
3. Room/window air conditioner
4. Evaporative/swamp cooler
5. I do not have any air conditioning in my home

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED]

Q30. What motivated you to install an **energy efficient** water heater rather than a less efficient one that would use more energy? [*RECORD VERBATIM*]

[ASK IF DUCT SEALING OR INSULATION WAS PERFORMED/INSTALLED]

Q31. What motivated you to [IF DUCT SEALING WAS PERFORMED, READ: repair your ductwork; IF ATTIC INSULATION WAS INSTALLED, READ: add insulation to your attic]? [*RECORD VERBATIM*]

[ASK IF POOL PUMP WAS INSTALLED]

Q32. What motivated you to install an ENERGY STAR pool pump? [*RECORD VERBATIM*]

[ASK IF POOL PUMP WAS INSTALLED]

Q33. Approximately what month do you first open your pool for the season?

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]

98. Don't know
99. Refused

[ASK IF POOL PUMP WAS INSTALLED]

Q34. Approximately what month do you close your pool for the season?

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Free-ridership

I'd like to ask a few questions about what you most likely would have done had you not received assistance from Duke Energy for the **[LIST ALL MEASURES]**.

[ASK IF THEY INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP]

Q35. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have installed the **[PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP]** and would have just continued using your old system
2. Would have postponed the purchase for at least one year
3. Would have bought a less expensive or less energy efficient system
4. Would have bought the exact same [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**], and paid the full cost yourself

[*Do not read*:]
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q35= 3]

Q36. You said you would have bought a/an [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**] that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy. Do you think it is more likely that you would have bought equipment that was…?

1. Almost as efficient as the one you bought, or
2. Significantly less efficient than the one you bought

[*Do not read*:]
98. Don't know
99. Refused

[ASK IF Q21=1]

Q37. If Duke Energy did not offer the additional rebate for quality installation services, would you have allowed your contractor to perform a quality installation service that ensured the [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**] was performing as efficiently as possible, even if it meant you had to pay more money?

[SINGLE RESPONSE]

1. Yes – I would have allowed quality installation if no rebates were available
2. No – I would not have allowed quality installation if no rebates were available

[*Do not read*:]
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q21=1]

Q38. If Duke Energy did not offer the additional rebate for quality installation services and your contractor did not offer you the service in their initial bid, would you have demanded that your contractor perform a quality installation service that ensured the [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**] was performing as efficiently as possible, even if it meant you had to pay more money?

[SINGLE RESPONSE]

1. Yes – I would have demanded quality installation if no rebates were available and my contractor did not initially offer it
2. No – I would not have demanded quality installation if no rebates were available and my contractor did not initially offer it

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF THEY INSTALLED: SMART THERMOSTAT]

Q39. Now we want to ask you about the smart thermostat you got with your [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**]. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have purchased the wi-fi enabled thermostat
2. Would have postponed the purchase of the wi-fi thermostat for at least one year
3. Would have installed some other type of thermostat, or
4. Would have bought the exact same wi-fi thermostat, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q39=3]

Q40. What type of thermostat would you have bought then? Would you have bought… [*READ*]

1. A manual non-programmable thermostat, or
2. A programmable thermostat that is *not* wi-fi enabled

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF THEY INSTALLED: HEAT PUMP WATER HEATER]

Q41. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have replaced my water heater
2. Would have postponed the water heater replacement for at least one year
3. Would have bought a less expensive or less energy efficient water heater, or
4. Would have bought the exact same high efficiency Heat Pump Water Heater, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q41=3]

Q42. You said you would have bought a water heater that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy. Do you think it is more likely that you would have bought equipment that was…?

1. Almost as efficient as the one you bought, or
2. Significantly less efficient than the one you bought

[*Do not read*:]

98. Don't know
99. Refused

[ASK IF THEY UPGRADED: ATTIC INSULATION]

Q43. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [READ LIST]

[SINGLE RESPONSE]

1. Would not have done the attic insulation
2. Put off doing attic insulation for at least one year
3. Would have added less insulation
4. Would have done the exact same upgrade, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q43=3]

Q44. You said you would have added less insulation if you had not received the rebate or information from Duke Energy. How much less insulation would you have purchased? Please answer in a percentage, such as “50% less.”

1. [*RECORD VERBATIM*:] _____
98. Don’t know
99. Refused

[ASK IF THEY DID DUCT SEALING]

Q45. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have had ducts sealed, insulated, or repaired
2. Would have postponed the work for at least one year
3. Would have had the exact same work done, and paid the full cost yourself

[*Do not read*:]
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF THEY INSTALLED A VARIABLE SPEED POOL PUMP]

Q46. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have installed or replaced the pool pump
2. Would have postponed the installation of the pool pump for at least one year
3. Would have bought a less expensive or less energy efficient pool pump, or
4. Would have had the exact same high efficiency pool pump installed, and paid the full cost yourself

[*Do not read*:]
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK ALL]

Q47. Using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential" how influential were the following factors on your decision to purchase the [**MEASURE**]? *How influential was…*

[*INTERVIEWER NOTE: IF RESPONDENT SAYS 'NOT APPLICABLE; I DIDN'T GET/USE THAT,' THEN FOLLOW UP WITH: "So would you say it was "not at all influential?" AND PROBE TO CODE*] [MATRIX QUESTION: SCALE]

Elements	0 – Not at all influential	1	2	3	4	5	6	7	8	9	10 – Extremely influential	98 DK	99 RF
The rebate you received													
Information or advertisements from Duke Energy, including their website													
Recommendation from your contractor													
Did anything else influence you? If so, please specify: _____ [*INTERVIEWER: PROBE IF UNCLEAR. RECORD VERBATIM RESPONSE*]													

[PROGRAMMER: REPEAT Q47 FOR EACH MEASURE IN MEASURE LIST. WHEN REPEATING, CALLERS CAN USE ABBREVIATED LANGUAGE (E.G.: "AND FOR THE INSULATION, HOW INFLUENTIAL WAS…"]

Spillover

Q48. Since receiving your rebate from Duke Energy for the [LIST ALL SMART $AVER MEASURES], have you purchased any other products or services to help save energy in your home?

1. Yes
2. No
98. Don't know

[If Q48= 1]

Q49. What **products** have you purchased and installed to help save energy in your home?

[*Do not read list. After each response, ask, "Anything else?"*] [MULTIPLE RESPONSE]

1. Bought energy efficient appliances
2. Moved into an ENERGY STAR home [*VERIFY: "Is Duke Energy still your gas or electricity utility?" Yes/No*]
3. Bought efficient heating or cooling equipment
4. Bought efficient windows

5. Added insulation
6. Sealed air leaks in windows, walls, or doors
7. Sealed or insulated ducts
8. Bought LEDs
9. Bought CFLs
10. Installed an energy efficient water heater
11. None – no other actions taken [*EXCLUSIVE ANSWER*]
96. Other, please specify: _____
98. Don't know [*EXCLUSIVE ANSWER*]

[ASK IF Q49<>11, 98, OR 99]

Q50. Did you get a rebate from Duke Energy for any of those products or services? If so, which ones? [MULTIPLE RESPONSE]

[LOGIC] Item
[IF Q49.1 IS SELECTED] 1. Bought energy efficient appliances
[IF Q49.2 IS SELECTED] 2. Moved into an ENERGY STAR home
[IF Q49.3 IS SELECTED] 3. Bought efficient heating or cooling equipment
[IF Q49.4 IS SELECTED] 4. Bought efficient windows
[IF Q49.5 IS SELECTED] 5. Bought additional insulation
[IF Q49.6 IS SELECTED] 6. Sealed air leaks in windows, walls, or doors
[IF Q49.7 IS SELECTED] 7. Sealed or insulated ducts
[IF Q49.8 IS SELECTED] 8. Bought LEDs
[IF Q49.9 IS SELECTED] 9. Bought CFLs
IF Q49.10 IS SELECTED] 10. Installed an energy efficient water heater
[IF Q49.96 IS SELECTED] **[Q49 open ended response]**
I did not get any Duke rebates [*EXCLUSIVE ANSWER*]
Don't know [*EXCLUSIVE ANSWER*]

[ASK IF ANY ITEM IN Q49 WAS SELECTED]

Q51. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did the [**LIST ALL SMART $AVER MEASURES**] rebate have on your decision to…

[MATRIX QUESTION: SCALE]

[LOGIC] Item	Response
[IF Q49.1 IS SELECTED] 1. Buy energy efficient appliances	0-10 scale with DK
[IF Q49.2 IS SELECTED] 2. Move into an ENERGY STAR home	0-10 scale with DK
[IF Q49.3 IS SELECTED] 3. Buy efficient heating or cooling equipment	0-10 scale with DK
[IF Q49.4 IS SELECTED] 4. Buy efficient windows	0-10 scale with DK
[IF Q49.5 IS SELECTED] 5. Buy additional insulation	0-10 scale with DK
[IF Q49.6 IS SELECTED] 6. Seal air leaks in windows, walls, or doors	0-10 scale with DK
[IF Q49.7 IS SELECTED] 7. Seal or insulate ducts	0-10 scale with DK
[IF Q49.8 IS SELECTED] 8. Buy LEDs	0-10 scale with DK
[IF Q49.9 IS SELECTED] 9. Buy CFLs	0-10 scale with DK
IF Q49.10 IS SELECTED] 10. Install an energy efficient water heater	0-10 scale with DK
[IF Q49.96 IS SELECTED] **[Q49 open ended response]**	0-10 scale with DK

[ASK IF Q49.1 IS SELECTED AND Q51.1 <> 0]

Q52. What kinds of appliance(s) did you buy?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Refrigerator
2. Stand-alone Freezer
3. Dishwasher
4. Clothes washer
5. Clothes dryer
6. Oven
7. Microwave
96. Other, please specify: _____
98. Don’t know
99. Refused

[ASK IF Q52 = 1-96]

Q53. Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q52]

[ASK IF Q52 = 5]

Q54. Does the new clothes dryer use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q49.3 IS SELECTED AND Q51.3 > 0]

Q55. What type of heating or cooling equipment did you buy?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Central air conditioner
2. Window/room air conditioner unit
3. Wall air conditioner unit
4. Air source heat pump
5. Geothermal heat pump
6. Boiler
7. Furnace
8. Wifi-enabled thermostat
96. Other, please specify: _____
98. Don't know
99. Refused

[ASK IF Q55= 6-7]

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q55= 1-7, 96]

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No

98. Don't know
99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q55, EXCLUDING wifi-enabled thermostat]

[ASK IF Q49.4 IS SELECTED AND Q51.4 > 0]

Q58. How many windows did you install?

1. [*RECORD VERBATIM* _____]
98. Don't know
99. Refused

[ASK IF Q49.5 IS SELECTED AND Q51.5 > 0]

Q59. Did you add insulation to your attic, walls, or below the floor?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Attic
2. Walls
3. Below the floor
98. Don't know
99. Refused

[ASK IF Q59<>98-99]

[PROGRAMMER: REPEAT Q60 FOR EACH ITEM MENTIONED IN Q59]

Q60. Approximately what proportion of the [ITEM MENTIONED IN Q59] space did you add insulation?

1. [RECORD VERBATIM AS % - INPUT MID-POINT IF RANGE IS OFFERED:] _____[IF NEEDED: *Your best estimate is fine*]
2. Don't know
99. Refused

[ASK IF Q49.8 IS SELECTED AND Q51.8 > 0]

Q61. How many of LEDs did you install in your property?

1. [RECORD VERBATIM:] _____ [IF NEEDED: *Your best estimate is fine*]
2. Don't know
99. Refused

[ASK IF Q49.9 IS SELECTED AND Q51.9 > 0]

Q62. How many of CFLs did you install in your property?

1. [RECORD VERBATIM:] _____ [IF NEEDED: *Your best estimate is fine*]
2. Don't know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]

Q63. Does the new water heater use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]

Q64. Which of the following water heaters did you purchase? [*read list*]

1. A traditional water heater with a large tank that holds the hot water
2. A tankless water heater that provides hot water on demand
3. A solar water heater
4. Other, please specify: _____
98. Don't know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]

Q65. Is the new water heater an ENERGY STAR model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

How They Search for EE Information

[ASK ALL]

Q66. Where do you typically search for information on how to save energy in your property?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Online – read reviews about products
2. Go to utility website

3. Read my utility information – it has tips on how to save energy
4. Go to the store and talk to salespeople
5. Look for ENERGY STAR logo on products
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. Not applicable – I don't typically search for information on how to save energy in my home/property
98. Don't know
99. Refused

Program Satisfaction and Challenges

The next few questions are about your satisfaction with the program.

[ASK ALL]

Q67. Using a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied," how satisfied were you with the rebate amount for [**LAST PROJECT**]? [SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK ALL]

Q68. How satisfied were you with how long it took to receive that rebate? Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied." [SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK IF Q68<5 (Somewhat to Very Dissatisfied)]

Q69. Why did you give that rating? _____ [RECORD VERBATIM]

[ASK ALL]

Q70. In the course of participating in the Duke Smart $aver program, how often did you contact Duke Energy or program staff with questions?

[*Do not read list*] [SINGLE RESPONSE]

1. Never
2. Once
3. 2 or 3 times
4. 4 times or more
98. Don't know
99. Refused

[ASK IF Q70 = 2-4]

Q71. How did you contact them?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Phone
2. Email
3. Fax
4. Letter
5. In person

98. Don't know
99. Refused

[ASK IF Q70 =2-4]

Q72. Using that same scale, how satisfied were you with these communications? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK IF Q72<5 (Somewhat to Very Dissatisfied)]

Q73. Why did you give that rating? _____ [RECORD VERBATIM]

[ASK ALL]

Q74. Have you noticed any savings on your electric bill since the [**LAST PROJECT**] project?

[SINGLE RESPONSE]

1. Yes, they noticed savings
2. No - They looked but **did not** notice any savings
3. No - They looked but it is too soon to tell
4. They didn't look
98. Don't know
99. Refused

[ASK IF Q74= Yes (if noticed savings)]

Q74_B. How satisfied are you with any savings you noticed on your electric bill since the [**LAST PROJECT**] project? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK ALL]

Q75. How satisfied are you with your [**LAST PROJECT**] project? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*] [*INTERVIEWER NOTE: IF RESPONDENT SAYS 'TOO SOON TO TELL,' THEN FOLLOW UP WITH: "So would you say you are "Neither satisfied nor dissatisfied?" or you just don't know yet AND PROBE TO CODE*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK IF Q75<5 (Somewhat to Very Dissatisfied)]

Q76. Why did you give that rating?

1. [*RECORD VERBATIM*] _____
98. Don't know
99. Refused

[ASK ALL]

Q77. How satisfied are you with the interaction with the contractors who worked on the [**LAST PROJECT**] project? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK IF Q77< 5 (Somewhat to Very Dissatisfied)]

Q78. Why did you give that rating?

1. [*RECORD VERBATIM*] _____
98. Don't know
99. Refused

Q79. How satisfied you are with Duke Energy's overall performance as your electricity supplier? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

Q80. Would you say that your participation in Duke Energy Smart $aver Rebate Program has had a positive effect, a negative effect, or no effect on your overall satisfaction with Duke Energy?

1. Negative effect
2. No effect
3. Positive effect
98. Don't know
99. Refused

[ASK ALL]

Q81. Finally, if you were rating your overall satisfaction with the Duke Energy Smart $aver Rebate Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied? [SINGLE RESPONSE]

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't Know
99. Refused

[ASK IF Q81 = 4 or 5]

Q82. Why do you give that rating? _____

[ASK ALL]

Q83. Do you have any suggestions to improve Duke Energy's Smart $aver Program?

1. [YES, *RECORD VERBATIM*] _____
2. No
98. Don't know
99. Refused

Demographics/Property Characteristics

Finally, I just need to ask you some questions about the residence where the rebated work was done.

[ASK ALL]

Q84. Do you live at this residence where the work was performed?

1. Yes
2. No
99. Refused

[ASK IF Q84=2]

Q85. Are you a property manager or an owner of the residence where the work was performed?

1. Owner
2. Property manager
96. Other, please specify: [OPEN-ENDED RESPONSE]
99. Refused

[ASK IF Q84=1]

Q86. Do you own or rent this residence?

[SINGLE RESPONSE]

1. Own
2. Rent
98. Don't know
99. Refused

[ASK IF Q86=Rent]

Q87. Do you pay your own electric bill or is it included in your rent? [*DO NOT READ*]

[SINGLE RESPONSE]

1. Pay own bill
2. Included in rent
98. Don't know
99. Refused

[ASK ALL]

Q88. Approximately when was this residence first built? [*DO NOT READ*]

[SINGLE RESPONSE]

1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006-2010
8. 2011-2015
9. 2016
98. Don't know
99. Refused

[ASK ALL]

Q89. Excluding unfinished basements, how many square feet is the residence?

1. NUMERICAL OPEN END [RANGE 0-99,999] _____
98. Don't know
99. Refused

[ASK IF Q89=Don’t Know or Refused]

Q90. Would you estimate the residence is about: [*READ LIST*]

[SINGLE RESPONSE]

1. less than 1,000 sqft
2. 1,001-2,000 sqft
3. 2,001-3,000 sqft
4. 3,001-4,000 sqft
5. 4,001-5,000 sqft
6. Greater than 5,000 sqft
98. Don’t know

99. Refused

[ASK ALL]

Q91. Does the primary heating system at the residence run on… [*READ*]

[SINGLE RESPONSE]

1. Electricity
2. Natural Gas (not propane)
3. Liquid propane gas
4. Fuel Oil
5. Wood
6. Or something else, please specify: [OPEN-ENDED RESPONSE]

[*Do not read list*:]

98. Don't know
99. Refused

[ASK ALL]

Q92. I'm going to read a list of income ranges. Please stop me when I reach the range that includes your annual household income. [*READ LIST*]

[SINGLE RESPONSE]

1. Less than $25,000
2. $25,000 to less than $50,000
3. $50,000 to less than $75,000
4. $75,000 to less than $100,000
5. $100,000 to less than $150,000
6. $150,000 or more

98. Don't know
99. Refused

That is all of the questions I have for you today. Thank you very much for your time

Appendix D Participant Survey Results

This section reports the results from each question in the participant survey. Since the results reported in this appendix represent the "raw" data (that is, none of the open-ended responses have been coded and none of the scale questions have been binned), some values may be different from those reported in the Process Evaluation Findings chapter (particularly: percentages in tables with Other categories and scale response questions). Only respondents who completed the survey are included in the following results.

Q1. I'm going to read a list of building types. Please stop me when I mention the building type that best describes the residence where this work was done.

Response Option	Percent (n=73)
Single-family detached home	89%
Factory manufactured single family home	3%
Row house or town house	5%
Duplex	1%
Triplex	0%
Apartment or condo building with four or more units	1%
Other	0%
Don't know	0%
Refused	0%

Q2. How did you hear about the Duke Energy Smart $aver rebate(s) that you received?

Response Option	Count (n=73)
Airworks told us about it when they came out.	1
Company that did hvac system did everything through Duke Energy for us.	1
Company that installed the unit.	1
conbtractor	1
contractor	1
contratcor	4
Doesn't remember anything about the rebate.	1
Don't remember.	1
From let see aimes receiving and plumping put it in.	1
From my neighbor.	1
From my vendor, the people the air conditioning folks.	1
From the air conditioner installers.	1
from the contractor	1
from the installer	1
From the installer.	1
From the people that installed the air conditioning.	1
from the pool installer	1
from thje contractor	1
Guy that puts the heat and air in the units, told us about it.	1
hvac installer	1
I believe I read it on the internet when I was researching pool pumps.	1
I Don’t know, unless it was applied for by the person who put it in.	1
I don't remember that.	1
I got an energy efficient heat pump and they called me about it.	1
I got one for my AC and one for my pump.	1
I picked it up from a mailer. The contractor I used was recommended by Duke.	1
I think it was the sales person who told us when he was writing up the contract for the new AC.	1
I think the Guy that installed our HVAC	1
I was in need in repair and they were going to stop making the freon. The guy that came for the repair told me about the rebate.	1
In the duke energy bill and the contractor that did the work.	1
insert in the statement	1
It was actually through the person that installed the equipment.	1
It was through my AC guy. He's the one who mentioned it and did it.	1
mailer	1
on the internet	1

Response Option	Count (n=73)
on the my energy alert	1
One: Online from Duke Energy Website because I moved from FL and got a rebate from that utility company	
Two: The contractor that I got the AC unit through mentioned it.	1
Read about it online. Also, the people that installed it said we would get a rebate.	1
Repairman from All Seasons told us about it.	1
the company	1
the contractor	1
The Contractor	1
The contractor told me.	1
The guy that put the heat in, the brotham brothers.	1
The people that put the AC in	1
the person who installed the HVAC	1
The website, the Duke Energy Website.	2
Through a vendor at our job.	1
Through our installer, hvac company.	1
Through the company that installed the air conditioner	1
Through the company that installed the unit.	1
through the contractor	1
Through the contractor	1
Through the contractor that did the work	1
Through the heating and air company.	1
through the HVAC company	1
Through the installers. The sales people.	1
Through the patterson, company that installed the air conditioning for the heat pump.	1
through the representative that did the install	1
through the vendor	1
throught the contractor	1
unknown	1
We found out about it from the Heating and AC contractor	1
website	1
went online	1

Q3. Are you familiar with other energy-efficiency rebates that Duke Energy offers, aside from the [LIST ALL MEASURES THEY RECEIVED FROM SMART $AVER PROGRAM] rebate(s)?

Response Option	Percent (n=73)
Yes	30%
No	70%
Don't know	0%
Refused	0%

Q4. [If Q3=YES] Which other rebates are you familiar with?

Response Option	Percent (n=22)*
Heat pump water heater rebate	9%
Heating and cooling system rebate	14%
Geothermal heat pump rebate	14%
Smart Wi-Fi enabled thermostat rebate	5%
Attic insulation and air seal rebate	5%
Duct sealing/insulation rebate	5%
In-home energy audit	9%
Pool pump rebate	9%
Power Manager bill discounts (for allowing Duke Energy to ramp down air conditioning during peak usage events)	5%
Discounted efficient lighting (CFLs, LEDs, and specialty bulbs)	36%
Other	9%
Don't know	5%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=3)
Solar Power	1
Washers, things like that	1

Q5. [If Q3=YES] Have you received any of these other rebates?

Response Option	Percent (n=22)
Yes	36%
No	59%
Don't know	5%
Refused	0%

Q6. [If Q5=YES and Q4<>DON'T KNOW OR REFUSED] Which rebate(s) did you receive?

Response Option	Percent (n=9)

Not asked*	100%

* Due to a programming error, this question was not asked.

Q7. [If Q5=YES] Did you receive the [INSERT REBATED MEASURES FROM Q6] before or after [PROJECT #1 LIST] work was done? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN Q6]

Response Option	Percent (n=?)
Not asked*	100%

* Due to a programming error, this question was not asked.

Q8. [IF Q7=AFTER OR Q7=BOTH BEFORE AND AFTER] Using a scale from 0 to 10, where 0 means “Not at all influential” and 10 means “Extremely influential,” how influential was the rebate for [PROJECT #1 LIST] in your decision to take advantage of Duke Energy’s [INSERT RESPONSE FROM Q6]? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN Q6 WHERE RESPONSE TO Q7=AFTER OR Q7=BOTH BEFORE AND AFTER]

Response Option	Percent (n=?)
Not asked*	100%

* Due to a programming error, this question was not asked.

Q9. [ASK IF RESPONDENT HAS A PROJECT #2 LIST] Using a scale from 0 to 10, where 0 means “Not at all influential” and 10 means “Extremely influential,” how influential was the rebate for [PROJECT#1 LIST] in your decision to take advantage of additional Duke Energy rebates for [PROJECT#2 LIST]?

Response Option	Percent (n=73)
Not asked*	100%

* No respondents met display logic condition.

Q10. [ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED]

Which of the following best describes the condition of the previous HVAC system that you replaced with a [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP]?

Response Option	Percent (n=30)*
It was broken or malfunctioning	70%
It was getting old, or	43%
It was in good working condition	7%
Other	7%
Don't know	0%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=2)
It was a space heater that it was replacing.	1
It was undersized for the house.	1

[IF CENTRAL AIR CONDITIONER WAS INSTALLED] Which of the following best describes the condition of the previous air conditioner that you replaced?

Response Option	Percent (n=33)*
It was broken or malfunctioning	42%
It was getting old, or	76%
It was in good working condition	0%
Other	0%
Don't know	0%
Refused	0%

* Multiple responses allowed.

Q11. [ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED] Approximately, how many years old was the previous HVAC unit that you replaced with your new [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP]?

Verbatim Response	Count (n=63)
10	5
10 year old	1
10 years	1
10 years roughly	1
11	1
12	1
12 years old	1
13	4
14	1
15	5
16	1
16 years old	1
17	2
17 or 18 years old	1
17+ years old.	1
18	5
18 years old	1
20	7
20 years old	1
20 years old.	1
21 or 22	1
23	2
24	1
25	1
26	1
29	1
30	1
30 years old and still working fine.	1
4	1
5	1
8	2
9.5	1
approx 15 years	1
approximately 20	1
Doesn't know	1
it was 2002 or 2003	1
probably 18 or 19	1

Verbatim Response	Count (n=63)
probably 7	1
unknown	1

Q12. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] What motivated you to install an energy efficient system rather than a less efficient one that would use more energy?

Verbatim Response	Count (n=63)
Always looking for the best energy-efficiency regardless of what it is.	1
Because it was old.	1
Because of all the dang money we were spending on electricity. We were tired of paying so much on our energy bill.	1
Because the one I had was propane and propane is expensive.	1
Because what they offered. It was able to do what we need it to do.	1
cost	1
Cost	3
cost and better for the environment	1
cost and efficiency made sense	1
Cost savings	1
Cost savings.	1
cut cost	1
Fact that we were upgrading, might as well choose one that uses less energy.	1
Get a cheaper deal each month and one that would last longer.	1
Guess the main reason was the actual rebate.	1
I plan to stay in this house and I know I can recoup the cost through energy efficiency for both the AC and the Furnace.	1
I try to go with something that's more efficient.	1
It's what was recommended by the AC company.	1
Just having a better system, and having a cheaper cost system. I Don't know they put it one that was not what it should have been.	1
Just the energy efficiency.	1
Just to be more energy efficient.	1
Just to save money.	1
Long-Term Savings	1
Lower Bill, Better for Environment.	1
Lower bills and more consistent cooling.	1
makes sense for rverybody	1
Money!	1
Our bills were really really high.	1
Over the long-haul, end up being cheaper	1
price	1
Read through a lot of things about energy savings, Long term savings	1
save money	4
Save Money	1
save money and energy	1
save money and to help with the environment	1

Verbatim Response	Count (n=63)
Save Money, Save Energy, No brainer!	1
Save money.	1
Save on my energy bill.	1
Saving	1
saving on the cost	1
savings	1
savings and the rebate	1
smaller bills	1
Smarter Long Term Investment.	1
That's a no-brainer.	1
The cost and be cheaper, and better for environment and would've got the rebate.	1
The one that made the most sense to me.	1
the return on the investment is good	1
The sales person who came out told us the options we had.	1
the savings	1
to make the home more efficient	1
to save money	1
To save money and cut down our cost.	1
Try to be conservative, recycle things.	1
Try to do that on anything that has good energy star ratings, try to do that on all electrical appliances.	1
wanted it to be dependable.	1
We got a good deal on it.	1
We wanted to save energy.	1

Q13. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] I'd like to know how you selected the specific make and model of the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] you purchased. Would you say that you chose it…

Response Option	Percent (n=63)
Yourself, based entirely on your own research?	24%
From a list of options provided by the contractor?	57%
Because it was the only option recommended by your contractor?	13%
Other	6%
Don't know	0%
Refused	0%

Verbatim Other Response	Count (n=4)
Combination of my own research and the several options provided by contractor.	1
I just asked he contractor what the best unit to buy, he said it was the best one.	1
talked with a neighbor	1
Refused	1

Q14. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] Suppose the contractor that installed your [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] did not offer high efficiency [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP]s that qualify for Duke rebates. Which of the following is most likely what you would have done?

Response Option	Percent (n=63)
You would have installed the cheaper, less efficient, unit that would not have qualified for rebates if that's all your contractor offered, or	14%
You would have looked for a contractor that could install a rebate-qualified high efficiency unit	84%
Other	2%
Don't know	0%
Refused	0%

Verbatim Other Response	Count (n=1)
Just kept old unit	1

Q15. [ASK IF SMART THERMOSTAT INSTALLED] Which of the following best describes the old thermostat that you replaced?

Response option	Percent (n=32)
Manual non-programmable thermostat,	50%
Programmable thermostat that does not communicate with your Wi-Fi network, or	47%
Programmable thermostat that communicates with your Wi-Fi network	3%
Other	0%
Don't know	0%
Refused	0%

Q16. [ASK IF SMART THERMOSTAT INSTALLED] Thinking of your old thermostat, at what temperature was that thermostat typically set in the winter?

Verbatim Response	Count (n=32)
55	1
60	1
64	1
65	3
66	1
67	1
68	2
69	1
69-70	1
69-71	1
70	8
72	6
74	1
75	1
76-77	1
Don't know	2

Q17. [ASK IF SMART THERMOSTAT INSTALLED] And what about your new wi-fi thermostat? At what temperature is the new thermostat typically set in the winter?

Verbatim Response	Count (n=32)
55	1
60	1
64	1
65	2
65-66	1
66	2
67	1
68	4
69	1
69-70	1
70	5
72	5
76-77	1
Don't know	6

Q18. [ASK IF SMART THERMOSTAT INSTALLED] If you used your old thermostat to control air conditioning, at what temperature was your old thermostat typically set in the summer for air conditioning?

Verbatim Response	Count (n=32)
68	2
70	5
71	1
71-72	1
72	5
73	1
74	7
75	2
76	1
76-77	1
77	1
78	2
Did not use my old thermostat to control air conditioning	1
Don't know	2

Q19. [ASK IF SMART THERMOSTAT INSTALLED AND Q18<>DID NOT USE MY OLD THERMOSTAT TO CONTROL AIR CONDITIONING] And what about your new wi-fi thermostat? At what temperature is the new thermostat typically set in the summer?

Verbatim Response	Count (n=31)
65	1
68-72	1
69-71	1
70	4
71-72	1
72	3
73	1
74	9
75	2
76	2
77	2
77-78	1
78	2
79	1

Q20. [ASK IF SMART THERMOSTAT INSTALLED] What motivated you to install a wi-fi enabled thermostat?

Verbatim Response	Count (n=32)
amazing convenience and different options	1
background as IT. to make it more comfortable	1
Better rebate with that.	1
came with the heat pump	1
came with the system	1
came with the unit	1
came with the unit	2
Came with the unit	1
Convenience and More Energy Efficient.	1
Convenient.	1
Future technology I guess.	1
I didn’t know it was Wi-fi.	1
I don't have Wi-fi, I guess it just came with it.	1
I Don’t know, I don't understand all these terms.	1
I honestly Don’t know. It was an option and I took it. I like the idea of being able to control the temp with my phone.	1
I thought it would work better, as far as the programs and all that.	1
I wasn’t interested in the Wi-fi part of it. Just that it was high efficiency. Just that it was programmable.	1
it came with the system	1
It came with the unit.	1
It was recommended by the contractor.	1
Just a suggestion through the installer.	1
keeping up with the times	1
Loved the fact that control it from anywhere in the house.	1
nothing	1
Really only one that was offered to us.	1
So that we could get it on the phone and turn it up when we're away.	1
That was just what came with it.	1
That way we could do it on vacation if we had to adjust anything. More accessible.	1
Things I’ve been reading about them. It's the only way to go	1
unsure	1
We didn't choose that, it was just the one that was recommended.	1

Q21. [ASK IF HVAC TIER=2 OR 3, AND QUALITY INSTALL REBATE WAS RECEIVED] Program records show that you received an additional $60 rebate for a quality installation from your contractor. This additional rebate was included on the VISA gift card you received in the mail from Duke Energy. This rebate was for additional work

your contractor did to ensure that your new [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] was installed to run as efficiently as possible. Prior to today, were you aware that you received a quality installation rebate?

Response Option	Percent (n=28)
Yes	25%
No	68%
Don't know	7%
Refused	0%

Q22. [ASK IF Q21=YES] Prior to talking with the contractor that installed the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP], were you aware of quality installation practices that ensure the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] is installed to run as efficiently as possible?

Response Option	Percent (n=7)
Yes – I was already familiar with quality installation practices	71%
No – I was not previously familiar with quality installation practices	29%
Don't know	0%
Refused	0%

Q23. [ASK IF Q21=YES] Did your contractor let you choose between a standard installation service that was not eligible for the additional rebate and a quality installation that would get you an additional rebate from Duke Energy?

Response Option	Percent (n=7)
Yes – they let me choose between standard and quality	86%
No – they did not give me a choice	14%
Don't know	0%
Refused	0%

Q24. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Which of the following best describes the condition of the previous water heater that you replaced?

Response Option	Percent (n=1)
It was broken or malfunctioning	0%
It was getting old, or	100%
It was in good working condition	0%
Other	0%
Don't know	0%
Refused	0%

Q25. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Approximately, how many years old was the previous water heater that you replaced with your new heat pump water heater?

Verbatim Response	Count (n=1)
16	1

Q26. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Where did you install your new heat pump water heater?

Response Option	Percent (n=1)
Garage	0%
Basement	0%
Closet	0%
Laundry Room	0%
Other	100%
Don't know	0%
Refused	0%

Verbatim Other Response	Count (n=1)
Crawl space	1

Q27. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED AND IF Q26 <> DON'T KNOW OR REFUSED] Do you use your HVAC system to heat and cool the [PIPE IN ANSWER FROM Q26] where the heat pump water heater is located?

Response Option	Percent (n=1)
Yes	0%
No	100%
Other	0%
Don't know	0%
Refused	0%

Q28. [ASK IF AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP WAS NOT INSTALLED] What type of system do you use to heat your home?

Response Option	Percent (n=43)*
Heat pump	30%
Electric baseboard heaters	2%
Natural gas furnace	74%
Plug in space heaters	0%
Cadet wall heaters	0%
Other	7%
Don't know	0%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=3)
forced air	1
Geothermal	1
Propane heater.	1

Q29. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS NOT INSTALLED] What type of system do you use to cool your home?

Response Option	Percent (n=10)*
Central air conditioner	60%
Heat pump	30%
Room/window air conditioner	0%
Evaporative/swamp cooler	0%
Other	10%
Don't know	0%
Refused	0%
I do not have any air conditioning in my home	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=1)
Geothermal	1

Q30. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] What motivated you to install an energy efficient water heater rather than a less efficient one that would use more energy?

Verbatim Response	Count (n=1)
switched to solar and it would save more money	1

Q31. [ASK IF DUCT SEALING OR ATTIC INSULATION WAS PERFORMED/INSTALLED] What motivated you to [IF DUCT SEALING WAS PERFORMED, READ: repair your ductwork; IF ATTIC INSULATION WAS INSTALLED, READ: add insulation to your attic]?

Duct Sealing

Verbatim Response	Count (n=1)
needed to be done	1

Attic Insulation

Verbatim Response	Count (n=5)
need it	1
needed to be done	1
power bills were way high and wanted to lower the bills. A/C was really old	1
the bills were too high	1
Well, I knew it was thin. I just took the opportunity to handle it	1

Q32. [ASK IF POOL PUMP WAS INSTALLED] What motivated you to install an ENERGY STAR pool pump?

Verbatim Response	Count (n=4)
efficiency savings and the rebate from Duke help with the decision	1
Just doing the math on it and having a single speed pump as opposed to an energy efficient pump.	1
lower the bills. recommended by the pool company	1
the rebate	1

Q33. [ASK IF POOL PUMP WAS INSTALLED] Approximately what month do you first open your pool for the season?

Response Option	Percent (n=4)
January	0%
February	0%
March	0%
April	0%
May	50%
June	0%
July	0%
August	0%
September	0%
October	0%
November	0%
December	0%
Other	50%
Don't know	0%
Refused	0%

Verbatim Response	Count (n=2)
Year round	2

Q34. [ASK IF POOL PUMP WAS INSTALLED] Approximately what month do you close your pool for the season?

Response Option	Percent (n=4)
January	0%
February	0%
March	0%
April	0%
May	0%
June	0%
July	0%
August	0%
September	0%
October	25%
November	25%
December	0%
Other	25%
Don't know	0%
Refused	25%

Verbatim Response	Count (n=1)
Year round	1

I'd like to ask a few questions about what you most likely would have done had you not received assistance from Duke Energy Carolinas for the [LIST ALL MEASURES].

Q35. [ASK IF THEY INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Percent (n=63)
Would not have installed the [Measure]	0%
Would have postponed the purchase for at least one year	10%
Would have bought a less expensive or less energy efficient system	13%
Would have bought the exact same high efficiency [Measure], and paid the full cost yourself	71%
Other	2%
Don't know	3%
Refused	0%

Verbatim Other Response	Count (n=1)
Would have just kept shopping around.	1

Q36. [ASK IF Q35=WOULD HAVE BOUGHT A LESS EXPENSIVE OR LESS ENERGY EFFICIENT HEATING ND COOLING SYSTEM] You said you would have bought a/an [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy Carolinas. Do you think it is more likely that you would have bought equipment that was…?

Response Option	Percent (n=8)
Almost as efficient as the one you bought, or	75%
Significantly less efficient than the one you bought	25%
Don't know	0%
Refused	0%

Q37. [ASK IF Q21=YES] If Duke Energy did not offer the additional rebate for quality installation services, would you have allowed your contractor to perform a quality installation service that ensured the [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] was performing as efficiently as possible, even if it meant you had to pay more money?

Response Option	Percent (n=7)
Yes – I would have allowed quality installation if no rebates were available	71%
No – I would not have allowed quality installation if no rebates were available	14%
Other	0%
Don't know	0%
Refused	14%

Q38. [ASK IF Q21=YES] If Duke Energy did not offer the additional rebate for quality installation services and your contractor did not offer you the service in their initial bid, would you have demanded that your contractor perform a quality installation service that ensured the [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] was performing as efficiently as possible, even if it meant you had to pay more money?

Response Option	Percent (n=7)
Yes – I would have demanded quality installation if no rebates were available and my contractor did not initially offer it	86%
No – I would not have demanded quality installation if no rebates were available and my contractor did not initially offer it	0%
Other	0%
Don't know	0%
Refused	14%

Q39. [ASK IF THEY INSTALLED: SMART THERMOSTAT] Now we want to ask you about the smart thermostat you got with your [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP]. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Percent (n=32)
Would not have purchased the Wi-Fi enabled thermostat	9%
Would have postponed the purchase of the Wi-Fi thermostat for at least one year	0%
Would have installed some other type of thermostat, or	38%
Would have bought the exact same Wi-Fi thermostat, and paid the full cost yourself	44%
Other	6%
Don't know	3%
Refused	0%

Verbatim Other Response	Count (n=2)
I would have got whatever thermostat that went with the system	1
This was the only option. Only model available for the HVAC we purchased.	1

Q40. [ASK IF Q39=WOULD HAVE INSTALLED SOME OTHER TYPE OF THERMOSTAT] What type of thermostat would you have bought then? Would you have bought…

Response Option	Percent (n=12)
A manual non-programmable thermostat, or	17%
A programmable thermostat that is not Wi-Fi enabled	83%
Other	0%
Don't know	0%
Refused	0%

Q41. [ASK IF THEY INSTALLED: HEAT PUMP WATER HEATER] Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=1)
Would not have replaced my water heater	0%
Would have postponed the water heater replacement for at least one year	0%
Would have bought a less expensive or less energy efficient water heater, or	0%
Would have bought the exact same high efficiency Heat Pump Water Heater, and paid the full cost yourself	100%
Other	0%
Don't know	0%
Refused	0%

[ASK IF Q41=WOULD HAVE BOUGHT A LESS EXPENSIVE OR LESS ENERGY EFFICIENT WATER HEATER]

Q42. You said you would have bought a water heater that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy Carolinas Do you think it is more likely that you would have bought equipment that was…?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

[ASK IF THEY UPGRADED: ATTIC INSULATION]

Q43. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=5)
Would not have done the attic insulation	0%
Put off doing attic insulation for at least one year	60%
Would have added less insulation	0%
Would have done the exact same upgrade, and paid the full cost yourself	40%
Other	0%
Don't know	0%
Refused	0%

[ASK IF Q43=WOULD HAVE ADDED LESS INSULATION]

Q44. You said you would have added less insulation if you had not received the rebate or information from Duke Energy Carolinas. How much less insulation would you have purchased? Please answer in a percentage, such as "50% less."

Response Option	Percent (n=5)
Not asked*	100%

* No respondents met display logic condition.

[ASK IF THEY DID DUCT SEALING]

Q45. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=2)
Would not have had ducts sealed or repaired	0%
Would have postponed the work for at least one year	50%
Would have had the exact same work done, and paid the full cost yourself	50%
Other	0%
Don't know	0%
Refused	0%

[ASK IF THEY INSTALLED A VARIABLE SPEED POOL PUMP]

Q46. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=4)
Would not have installed or replaced the pool pump	0%
Would have postponed the installation of the pool pump for at least one year	0%
Would have bought a less expensive or less energy efficient pool pump, or	50%
Would have had the exact same high efficiency pool pump installed, and paid the full cost yourself	50%
Other	0%
Don't know	0%
Refused	0%

[ASK ALL]

Q47. Using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential" how influential were the following factors on your decision to purchase the [MEASURE]? How influential was…

Air-Source Heat Pump

Response Option	Percent (n=29)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	7%	34%	0%	0%
1	0%	3%	0%	0%
2	0%	3%	0%	0%
3	3%	7%	0%	0%
4	3%	0%	0%	0%
5	24%	7%	3%	0%
6	7%	7%	7%	0%
7	7%	7%	7%	3%
8	10%	14%	17%	0%
9	14%	3%	21%	3%
10	24%	10%	45%	10%
Don’t know	0%	3%	0%	41%
Refused	0%	0%	0%	41%

Verbatim Other Descriptor	Count (n=5)
A neighbor that used the contractor.	1
dependability and expected maintenance on the unit	1
I needed to fix the old one and they weren't sure if that would help. They said I needed a new one.	1
It was a good perk or a bonus to know I was getting a rebate.	1
Online and different sources giving information.	1

Attic Insulation and Air Sealing

Response Option	Percent (n=5)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	20%	40%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	0%	20%	0%	0%
6	40%	0%	0%	0%
7	20%	20%	0%	0%
8	20%	20%	0%	0%
9	0%	0%	0%	0%
10	20%	20%	40%	0%
Don't know	0%	0%	20%	100%
Refused	0%	0%	0%	0%

Central Air Conditioner

Response Option	Percent (n=33)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	9%	24%	0%	3%
1	0%	6%	0%	0%
2	3%	6%	0%	0%
3	6%	9%	0%	0%
4	3%	3%	0%	0%
5	21%	6%	6%	0%
6	9%	12%	0%	0%
7	15%	6%	9%	0%
8	15%	12%	21%	3%
9	6%	3%	18%	6%
10	9%	9%	45%	15%
Don't know	3%	3%	0%	55%
Refused	0%	0%	0%	18%

Verbatim Other Descriptor	Count (n=9)
Fact that the system broke and were looking to replace it.	1
How energy efficient it was.	1
Needing it to replace before the summer.	1
Neighbor got same information	1
no	1
Past experience with the product.	1
Rebate from contractor as well as Duke Energy.	1
Very high monthly bills and the age of our old unit.	1
We needed a new AC.	1

Duct Sealing

Response Option	Percent (n=1)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	0%	0%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	100%	0%	0%	0%
6	0%	0%	0%	0%
7	0%	0%	0%	0%
8	0%	0%	0%	0%
9	0%	0%	0%	0%
10	0%	100%	100%	0%
Don’t know	0%	0%	0%	100%
Refused	0%	0%	0%	0%

Geothermal Heat Pump

Response Option	Percent (n=1)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	100%	0%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	100%	0%	0%	0%
6	0%	0%	0%	0%
7	0%	0%	0%	0%
8	0%	0%	0%	0%
9	0%	0%	0%	0%
10	0%	0%	100%	0%
Don't know	0%	0%	0%	100%
Refused	0%	0%	0%	0%

Smart Thermostat

Response Option	Percent (n=32)			
	Rebate	Information or advertisements from Duke Energy Carolinas including their website	Recommendation from your contractor	Other
0	9%	34%	3%	0%
1	0%	0%	0%	0%
2	3%	6%	0%	0%
3	6%	6%	0%	0%
4	0%	0%	0%	0%
5	25%	6%	13%	0%
6	9%	6%	6%	0%
7	6%	19%	6%	0%
8	9%	6%	25%	3%
9	6%	3%	13%	0%
10	22%	3%	34%	0%
Don't know	3%	9%	0%	69%
Refused	0%	0%	0%	28%

Verbatim Other Descriptor	Count (n=1)
Research and information	1

Pool Pump

Response Option	Percent (n=4)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	50%	25%	0%
1	25%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	0%	25%	0%	0%
6	0%	0%	0%	0%
7	25%	25%	0%	0%
8	50%	0%	25%	0%
9	0%	0%	0%	0%
10	0%	0%	50%	25%
Don't know	0%	0%	0%	75%
Refused	0%	0%	0%	0%

Verbatim Other Descriptor	Count (n=1)
Research on different pool pumps.	1

Heat Pump Water Heater

Response Option	Percent (n=1)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	100%	0%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	100%	0%	0%	0%
4	0%	0%	0%	0%
5	0%	0%	0%	0%
6	0%	0%	100%	0%
7	0%	0%	0%	0%
8	0%	0%	0%	0%
9	0%	0%	0%	0%
10	0%	0%	0%	0%
Don't know	0%	0%	0%	100%
Refused	0%	0%	0%	0%

Quality Installation

Response Option	Percent (n=28)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	21%	39%	7%	4%
1	0%	4%	0%	0%
2	4%	0%	0%	0%
3	4%	4%	0%	0%
4	0%	4%	0%	0%
5	7%	4%	0%	0%
6	7%	4%	4%	0%
7	0%	0%	7%	0%
8	18%	11%	21%	4%
9	11%	11%	14%	0%
10	21%	11%	36%	11%
Don't know	7%	11%	11%	50%
Refused	0%	0%	0%	32%

Verbatim Other Descriptor	Count (n=4)
Brand	1
High efficiency.	1
Inefficiency of the unit and the high cost for Duke Energy with the unit.	1
Word of Mouth.	1

Q48. Since receiving your rebate from Duke Energy Carolinas for the [LIST ALL SMART $AVER MEASURES], have you purchased any other products or services to help save energy in your home?

Response Option	Percent (n=73)
Yes	30%
No	70%
Don't know	0%
Refused	0%

[If Q48=YES]

Q49. What products have you purchased and installed to help save energy in your home?

Response Option	Percent (n=22)
Bought energy efficient appliances	14%
Moved into an ENERGY STAR home [VERIFY: Duke Energy still your gas or electricity utility?]	0%
Bought efficient heating or cooling equipment	14%
Bought efficient windows	0%
Added insulation	5%
Sealed air leaks in windows, walls, or doors	5%
Bought LEDs	45%
Bought CFLs	5%
Installed an energy efficient water heater	14%
Sealed or insulated ducts	0%
None - no other actions taken	0%
Other	14%
Don't know	0%
Refused	0%

Verbatim Other Responses	Count (n=3)
Dish washer	1
High efficiency pool pump	1
solar panels	1

Q50. [ASK IF Q49<>NONE, DON'T KNOW, OR REFUSED] Did you get a rebate from Duke Energy for any of those products or services? If so, which ones?

Response Option	Percent (n=22)*
Bought energy efficient appliances	0%
Moved into an ENERGY STAR home	0%
Bought efficient heating or cooling equipment	9%
Bought efficient windows	0%
Bought additional insulation	0%
Sealed air leaks in windows, walls, or doors	0%
Sealed or insulated ducts	0%
Bought LEDs	14%
Bought CFLs	5%
Installed an energy efficient water heater	0%
Other	9%
I did not get any Duke rebates	59%
Don't know	9%
Refused	0%

* Multiple responses allowed.

Q51. [ASK IF ANY ITEM IN Q49 WAS SELECTED] On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did the [LIST ALL SMART $AVER MEASURES] rebate have on your decision to…

Buy Efficient Heating or Cooling Equipment

Response Option	Percent (n=3)
0	67%
1	0%
2	0%
3	0%
4	0%
5	33%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Buy Additional Insulation

Response Option	Percent (n=1)
0	100%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Sealed air leaks in windows, walls, or doors

Response Option	Percent (n=1)
0	100%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Buy LEDs

Response Option	Percent (n=10)
0	70%
1	0%
2	0%
3	0%
4	0%
5	10%
6	0%
7	0%
8	10%
9	0%
10	0%
Don't know	10%
Refused	0%

Buy CFLs

Response Option	Percent (n=1)
0	100%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Installed an energy efficient water heater

Response Option	Percent (n=3)
0	67%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	33%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Other

Response Option	Percent (n=3)
0	33%
1	0%
2	0%
3	0%
4	0%
5	33%
6	0%
7	0%
8	0%
9	0%
10	33%
Don't know	0%
Refused	0%

Q52. [ASK IF Q49.1 IS SELECTED AND Q51.1<>0 – NOT AT ALL INFLUENTIAL] What kinds of appliance(s) did you buy?

Response Option	Percent (n=1)
Refrigerator	0%
Stand-alone Freezer	0%
Dishwasher	0%
Clothes washer	0%
Clothes dryer	0%
Oven	0%
Microwave	0%
Other	100%
Don't know	0%
Refused	0%

Verbatim Other Response	Count (n=1)
TV	1

Q53. [ASK IF Q52<>DON'T KNOW OR REFUSED] Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

Television

Response Option	Percent (n=1)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q54. [ASK IF Q52=CLOTHES DRYER] Does the new clothes dryer use natural gas?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q55. [ASK IF Q49 BOUGHT EFFICIENT HEATING OR COOLING EQUIPMENT IS SELECTED AND Q51 FOR EFFICIENT HEATING OR COOLING EQUIPMENT > 0] What type of heating or cooling equipment did you buy?

Response Option	Percent (n=1)
Central air conditioner	100%
Window/room air conditioner unit	0%
Air source heat pump	0%
Geothermal heat pump	0%
Boiler	0%
Furnace	0%
Wi-Fi enabled thermostat	0%
Wall air conditioner unit	0%
Other	0%
Don't know	0%
Refused	0%

[ASK IF Q55=BOILER OR FURNACE]

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

[ASK IF Q55<>DON'T KNOW OR REFUSED]

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

Central Air Conditioner

Response Option	Percent (n=1)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q58. [ASK IF Q49 BOUGHT EFFICIENT WINDOWS IS SELECTED AND Q51 WINDOWS > 0] How many windows did you install?

Response Option	Percent (n=22)
Not asked*	100%

* No respondents met display logic condition.

Q59. [ASK IF Q49 ATTIC INSULATION IS SELECTED AND Q51 FOR ATTIC INSULATION > 0] Did you add insulation to your attic, walls, or below the floor?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q60. [ASK IF Q59<>DON'T KNOW OR REFUSED] Approximately what proportion of the [ITEM MENTIONED IN Q59] space did you add insulation?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q61. [ASK IF Q49 LEDS IS SELECTED AND Q51 FOR LEDS > 0] How many of LEDs did you install in your property?

Verbatim Other Response	Count (n=3)
12	1
27	1
Don't know	1

Q62. [ASK IF Q49 CFLS IS SELECTED AND Q51 FOR CFLS > 0] How many of CFLs did you install in your property?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q63. [ASK IF Q49 WATER HEATER IS SELECTED AND Q51 FOR WATER HEATER > 0] Does the new water heater use natural gas?

Response Option	Percent (n=1)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q64. [ASK IF Q49 WATER HEATER IS SELECTED AND Q51 FOR WATER HEATER > 0] Which of the following water heaters did you purchase? [read list]

Response Option	Percent (n=1)
A traditional water heater with a large tank that holds the hot water	100%
A tankless water heater that provides hot water on demand	0%
A solar water heater	0%
Other, please specify:	0%
Don't know	0%
Refused	0%

Q65. [ASK IF Q49 WATER HEATER IS SELECTED AND Q51 FOR WATER HEATER > 0] Is the new water heater an ENERGY STAR model?

Response Option	Percent (n=1)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q66. Where do you typically search for information on how to save energy in your property?

Response Option	Percent (n=73)*
Online - read reviews about products	48%
Go to utility website	25%
Read my utility information - it has tips on how to save energy	29%
Go to the store and talk to salespeople	1%
Look for ENERGY STAR logo on products	3%
Other, please specify:	5%
N/A - I don't typically search for information on how to save energy in my home/property	22%
Don't know	1%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=4)
Google	1
Information from Electrician, builders and contractors	1
Someone from Duke Energy gave information once.	1
talk to neighbors	1

Q67. Using a 0 to 10 scale where 0 means “very dissatisfied,” 5 means “neither satisfied nor dissatisfied,” and 10 means “very satisfied,” how satisfied were you with the rebate amount for [LAST PROJECT]?

Response Option	Percent (n=73)
0	1%
1	0%
2	0%
3	0%
4	3%
5	10%
6	5%
7	1%
8	11%
9	8%
10	59%
N/A	0%
Don’t know	1%
Refused	0%

Q68. How satisfied were you with how long it took to receive that rebate? Please use a 0 to 10 scale where 0 means “very dissatisfied,” 5 means “neither satisfied nor dissatisfied,” and 10 means “very satisfied.”

Response Option	Percent (n=73)
0	0%
1	0%
2	0%
3	3%
4	1%
5	8%
6	3%
7	3%
8	15%
9	12%
10	51%
N/A	1%
Don't know	3%
Refused	0%

Q69. [ASK IF Q68 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=3)
It's strange the contractor said it would take 4-5 weeks to get the rebate. It took much longer to get it. Contractor said it would be a rebate check, we got a visa gift card. Would be nice to just get a credit on our power bill because that's what we're using the visa gift card for. We would prefer a check or that amount of credit applied to our duke energy bill.	1
Took over a month and a half or two months I think.	1
Waiting for my rebate, three weeks go buy and I called. They dont know what I'm talking about. I was on the phone for 3 hours talking with 4 employees of duke. When I got the rebate it came from Raleigh and I told a supervisor, Williams, that she needed to inform her customer service about the rebates and about the Smart Saver Program.	1

Q70. In the course of participating in the Duke Smart $aver program, how often did you contact Duke Energy or program staff with questions?

Response Option	Percent (n=73)
Never	75%
Once	15%
2 or 3 times	8%
4 or more times	1%
Don't know	0%
Refused	0%

Q71. [ASK IF Q70=MORE THAN NEVER] How did you contact them?

Response Option	Percent (n=18)*
Phone	100%
Email	6%
Fax	0%
Letter	0%
In person	0%
Don't know	0%
Refused	0%

* Multiple responses allowed.

Q72. [ASK IF Q70 > NEVER] Using that same scale, how satisfied were you with these communications? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

Response Option	Percent (n=18)
0	6%
1	0%
2	0%
3	0%
4	0%
5	11%
6	0%
7	11%
8	11%
9	11%
10	50%
N/A	0%
Don’t know	0%
Refused	0%

Q73. [ASK IF Q72 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=1)
Because nobody knew about the Smart Saver Program. It's called communication with your employees. It's like NOBODY knew what I was talking about.	1

Q74. Have you noticed any savings on your electric bill since the [LAST PROJECT] project?

Response Option	Percent (n=73)
Yes, they noticed savings	62%
No - They looked, but did not notice any savings	10%
No - They looked, but it is too soon to tell	4%
They didn't look	14%
Don’t know	11%
Refused	0%

Q74_B. [ASK IF Q74=YES, NOTICED SAVINGS] How satisfied are you with any savings you noticed on your electric bill since the [LAST PROJECT] project?

Response Option	Percent (n=45)
0	0%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	7%
8	29%
9	4%
10	58%
Don't know	0%
Refused	2%

Q75. How satisfied are you with your [LAST PROJECT] project?

Response Option	Percent (n=73)
0	0%
1	0%
2	0%
3	1%
4	0%
5	1%
6	1%
7	4%
8	11%
9	12%
10	68%
Don't know	0%
Refused	0%

Q76. [ASK IF Q75 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=1)
the company was not good	100%

Q77. How satisfied are you with the interaction with the contractors who worked on the [LAST PROJECT] project?

Response Option	Percent (n=73)
0	0%
1	0%
2	1%
3	0%
4	1%
5	0%
6	0%
7	3%
8	7%
9	16%
10	71%
Don't know	0%
Refused	0%

Q78. [ASK IF Q77 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=2)
The company couldn't keep the same workers on the job. They made mistakes. They didn't do it right and had to be called back out. They caused damage to the house and made cracks in the and knocked some of the siding off.	1
They did make me aware of the replacement for the duct work rebate and after I called them about it they told me the inspection would be more than the rebate amount and refused to do it.	1

Q79. How satisfied you are with Duke Energy's overall performance as your electricity supplier?

Response Option	Percent (n=73)
0	0%
1	0%
2	0%
3	1%
4	0%
5	0%
6	4%
7	12%
8	12%
9	14%
10	56%
N/A	0%
Don't know	0%
Refused	0%

Q80. Would you say that your participation in Duke Energy Carolinas Smart $aver Rebate Program has had a positive effect, a negative effect, or no effect on your overall satisfaction with Duke Energy?

Response Option	Percent (n=73)
Negative effect	1%
No effect	15%
Positive effect	84%
Don't know	0%
Refused	0%

Q81. Finally, if you were rating your overall satisfaction with the Duke Energy Smart $aver Rebate Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?

Response Option	Percent (n=73)
Very satisfied	77%
Somewhat satisfied	16%
Neither satisfied nor dissatisfied	3%
Somewhat dissatisfied	4%
Very dissatisfied	0%
Don't know	0%
Refused	0%

Q82. [ASK IF Q81=SOMEWHAT OR VERY DISSATISFIED] Why do you give that rating?

Verbatim Response	Count (n=3)
Because I am very disappointed in the Thermostat. It's memory is having a negative impact on the environment of my house. I would prefer just a straight programmable thermostat like I had before, but I'd like to be able to control it through Wi-fi. I would like someone to call me about my thermostat.	1
Because there should be a higher value than $300 when you buy an entire system. I put in a heat pump with propane backup and an AC to the tune of $14,000 and I think a $300 rebate is kinda cheap. In Delaware, the rebate I got was around $2,500 for a complete Heater/AC system.	1
I don't want the prepaid debit card.	1

Q83. Do you have any suggestions to improve Duke Energy's Smart $aver Program?

Verbatim Response	Count (n=25)
As long as the contractors notify the customer about the rebates. I guess DUKE sends news letters so that customers know about the rebates. TV and Commercials don't help me at all. I do get letters from DUKE that I read once in a while, like the light bulb rebates.	1
Communication with their employees. So when someone calls with questions about the rebate, they know who to send them to.	1
Depending on the price and size of unit, that you are going to have a furnace or ac or both, or even a water heater, even of those major appliances, it would be nice to have a price range and base that cost on the rebate you received.	1
get more rebates and give a better LED	1
get with the Acosta Vendors about the additional savings and don't give them the option to participate or not	1
getting more information out to the public	1
give out rebate checks instead of Cards	1
Guess if anything, the only thing I would recommend is to have a pamphlet of some type about LED Bulbs, and other things.	1
Just keep doing what they're doing. If products come along, the rebate was a great idea. It was an expensive project and the rebate helped out a lot.	
That will encourage people to get a newer system.	1
Keep the good work up	1
larger rebate	1
Make it easier for their contractors to submit the info needed to get the rebate and if an error is made let the contractors resubmit it	1
make it more available to people	1
make more noticeable	1
make the surveys shorter	1
More availability of auditors or assessors in the western part of North Carolina. I'm in the mountains next to TN.	1
Only thing would suggest on Monthly Bill, what the temperature was during the time. Like to see something that would allow him to evaluate how efficient my unit is.	1
show where the big rebates are	1
that they check out who they recommend	1
The contractor was not aware Duke was not sending checks. Better information between contractors and Duke Energy.	1
The only thing that was a surprise that the rebate card more like a credit card, and not a cash rebate. The card itself could not be exchanged for cash.	1
They could promote a little bit more. If you don't go online, I Don't know, just think they could a little bit more promotion on it.	1
Think when I bought my washer and dryer, never heard if she qualified for anything with it.	1
Wasn't aware of a lot of it because they were just moving into the area. Just was	1

Verbatim Response	Count (n=25)
following the advice of our contractors. Smart Thermostat was replaced with a different type of thermostat after.	
Don't know	1

Q84. Do you live at this residence where the work was performed?

Response Option	Percent (n=73)
Yes	95%
No	4%
Refused	1%

Q85. [ASK IF Q84=NO] Are you a property manager or an owner of the residence where the work was performed?

Response Option	Percent (n=3)
Owner	67%
Property manager	33%
Other	0%
Refused	0%

Q86. [ASK IF Q84=YES] Do you own or rent this residence?

Response Option	Percent (n=69)
Own	100%
Rent	0%
Don't know	0%
Refused	0%

Q87. [ASK IF Q86=RENT] Do you pay your own electric bill or is it included in your rent

Response Option	Percent (n=69)
Not asked*	100%

* No respondents met display logic condition.

Q88. Approximately when was this residence first built?

Response Option	Percent (n=73)
Before 1960	12%
1960-1969	7%
1970-1979	16%
1980-1989	11%
1990-1999	29%
2000-2005	14%
2006-2010	8%
2011-2015	0%
2016-2017	0%
Don't know	3%
Refused	0%

Q89. Excluding unfinished basements, how many square feet is the residence?

Verbatim Response	Count (n=73)
1000	2
1100	1
1200	2
1260	1
1380	1
1400	2
1425	1
1490	1
1500	2
1553	1
1576	1
1590	1
1600	3
1700	2
1800	4
1898	1
1900	1
1950	1
1990	1
2000	4
2150	1
2200	1

Verbatim Response	Count (n=73)
2300	2
2384	1
2400	1
2500	2
2600	1
2700	6
2800	1
2900	1
3000	4
3100	2
3200	2
3500	1
3600	1
3700	1
4000	2
4800	1
5000	1
5800	1
6000	1
Don't know	6

Q90. [ASK IF Q89=DON'T KNOW OR REFUSED] Would you estimate the residence is about:

Response Option	Percent (n=6)
less than 1,000 sq. ft.	0%
1,001-2,000 sq. ft.	17%
2,001-3,000 sq. ft.	33%
3,001-4,000 sq. ft.	17%
4,001-5,000 sq. ft.	0%
Greater than 5,000 sq. ft.	0%
Don't know	33%
Refused	0%

Q91. Does the primary heating system at the residence run on…

Response Option	Percent (n=73)
Electricity	53%
Natural Gas (not propane)	41%
Liquid propane gas	4%
Fuel Oil	0%
Wood	0%
Or something else	1%
Don't know	0%
Refused	0%

Verbatim Response	Count (n=1)
Geothermal	1

Q92. I'm going to read a list of income ranges. Please stop me when I reach the range that includes your annual household income.

Response Option	Percent (n=73)
Less than $25,000	4%
$25,000 to less than $50,000	8%
$50,000 to less than $75,000	14%
$75,000 to less than $100,000	11%
$100,000 to less than $150,000	14%
$150,000 or more	16%
Don't know	3%
Refused	30%

Appendix E Trade Ally Survey Results

This section reports the results from each question in the trade ally survey. Since the results reported in this appendix represent the "raw" data (that is, none of the open-ended responses have been coded and none of the scale questions have been binned), some values may be different from those reported in the Process Evaluation Findings chapter (particularly: percentages in tables with Other categories and scale response questions). Only respondents who completed the survey are included in the following results.

S1. How many locations does your company have?

Response Option	Percent (n=58)
One	85%
Two	15%
Three	0%
Four	0%
Five	0%
More than five	0%
Don't know	0%

S2. [Ask if S1 > ONE] We would like to talk today about the projects that were sold and installed by the [PIPE IN ADDRESS] location. Are you able to speak to the work associated with that location?

Response Option	Percent (n=9)
Yes	100%
No	0%
Don't know	0%
Refused	0%

S3. Does your firm primarily focus on new construction or existing home projects?

Response Option	Percent (n=58)
Existing Homes	78%
New construction projects	22%
Don't know	0%
Refused	0%

Q1. How did you first hear about Duke Energy Smart $aver rebate offers for HVAC equipment, variable speed pool pumps, insulation, and duct sealing?

Response Option	Percent (n=58)
Word-of-mouth (co-worker, another contractor)	14%
Duke Energy website	2%
Duke Energy program representative	26%
TV/Radio/Newspaper/Billboard Ad	0%
Event	2%
Other	17%
Don't know	40%
Refused	0%

Verbatim Other Response	Count (n=10)
were already filing them when I started	1
Through Pump Manufactures	1
They were doing it when I started 3 years ago.	1
The boss got us enrolled	1
Sense we've been in business	1
Followed in from an old program.	1
Email or letter. It's been so long ago.	1
Been doing it sense employee first started.	1
Already in place when I started working here	1
Already in place over a year when I started	1

Q2. Since August 2016, about what proportion of the [MEASURE] projects that your company did in Duke territory would have qualified for a Duke rebate?

Central Air Conditioners

Verbatim Responses	Count (n=42)
0%	1
10%	1
20%	2
25%	3
30%	2
33%	1
40%	5
50%	7
60%	1
70%	2
80%	6
85%	4
90%	2
99.9%	1
100%	2
Don't know	2

Air Source Heat Pumps

Verbatim Responses	Count (n=46)
0%	1
10%	3
20%	1
25%	4
30%	1
33%	1
40%	3
50%	7
60%	1
70%	1
75%	2
80%	6
85%	3
90%	4
100%	6
Don't know	2

Attic Insulation & Air Sealing

Verbatim Responses	Count (n=5)
5%	1
10%	1
15%	1
25%	1
40%	1

Pool Pumps

Verbatim Responses	Count (n=5)
50%	1
80%	1
85%	1
95%	1
Don't know	1

Heat Pump Water Heater

Verbatim Responses	Count (n=3)
15%	1
40%	1
100%	1

Geothermal Heat Pump

Verbatim Responses	Count (n=4)
0%	1
90%	1
100%	1
Don't know	1

Duct Sealing

Verbatim Responses	Count (n=4)
25%	1
40%	1
100%	1
Don't know	1

Q3. And since August 2016, what percent of all your Duke rebate qualified [MEASURE] projects did you actually apply for a rebate? [If needed: Your best estimate is fine.]

Central Air Conditioners

Verbatim Responses	Count (n=42)
0%	1
5%	1
30%	2
50%	1
55%	1
70%	1
80%	2
90%	3
100%	28
Don't know	2

Air Source Heat Pumps

Verbatim Responses	Count (n=46)
0%	1
5%	2
20%	1
25%	1
50%	1
70%	1
85%	1
90%	4
95%	2
100%	29
Don't know	3

Attic Insulation and Air Sealing

Verbatim Responses	Count (n=5)
15%	1
80%	1
95%	1
100%	2

Pool Pumps

Verbatim Responses	Count (n=5)
100%	4
Don't know	1

Heat Pump Water Heaters

Verbatim Responses	Count (n=3)
10%	1
100%	2

Geothermal Heat Pumps

Verbatim Responses	Count (n=4)
0%	1
100%	2
Don't know	1

Duct Sealing

Verbatim Responses	Count (n=4)
10%	1
15%	1
95%	1
100%	1

Q4. About what proportion of your rebate qualifying [MEASURE] customers specifically requested the [MEASURE] on their own and were not influenced by your recommendation?

Central Air Conditioners

Verbatim Responses	Count (n=42)
0%	10
2%	1
5%	5
10%	1
15%	1
20%	2
25%	1
40%	1
50%	3
60%	1
75%	1
80%	1
85%	1
90%	2
100%	2
Don't know	9

Air Source Heat Pumps

Verbatim Responses	Count (n=46)
0%	9
1%	1
2%	2
3%	1
5%	2
10%	3
15%	1
20%	2
25%	2
30%	1
50%	5
75%	2
80%	1
90%	1
100%	2
Don't know	10

Attic Insulation and Air Sealing

Verbatim Responses	Count (n=5)
25%	1
50%	2
75%	1
80%	1

Pool Pumps

Verbatim Responses	Count (n=5)
0%	1
2%	1
50%	1
80%	1
Don't know	1

Heat Pump Water Heaters

Verbatim Responses	Count (n=3)
0%	2
10%	1

Geothermal Heat Pumps

Verbatim Responses	Count (n=4)
0%	1
50%	1
60%	1
Don't know	1

Duct Sealing

Verbatim Responses	Count (n=4)
25%	1
30%	1
60%	1
75%	1

Q5. Using a 0 to 10 scale, where 0 is “not at all influential” and 10 is “extremely influential,” how much influence has the Duke program had on your business practice of recommending rebate qualifying [MEASURE] to your customers?

Central Air Conditioners

Response Option	Percent (n=42)
0	5%
1	5%
2	0%
3	2%
4	5%
5	19%
6	17%
7	10%
8	7%
9	10%
10	12%
Don't know	10%
Refused	0%

Air Source Heat Pumps

Response Option	Percent (n=46)
0	9%
1	4%
2	2%
3	2%
4	0%
5	17%
6	11%
7	9%
8	13%
9	4%
10	13%
Don't know	15%
Refused	0%

Attic Insulation and Air Sealing

Response Option	Percent (n=5)
0	0%
1	0%
2	0%
3	0%
4	40%
5	60%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Pool Pumps

Response Option	Percent (n=5)
0	0%
1	0%
2	20%
3	0%
4	0%
5	0%
6	20%
7	0%
8	20%
9	20%
10	20%
Don't know	0%
Refused	0%

Heat Pump Water Heaters

Response Option	Percent (n=3)
0	33%
1	0%
2	0%
3	33%
4	0%
5	33%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Geothermal Heat Pumps

Response Option	Percent (n=4)
0	0%
1	0%
2	25%
3	0%
4	0%
5	25%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	50%
Refused	0%

Duct Sealing

Response Option	Percent (n=4)
0	25%
1	0%
2	0%
3	0%
4	25%
5	25%
6	0%
7	25%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Q6. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS] Thinking back to before you were involved in the Duke Energy program, how often did you recommend higher efficiency equipment that uses less energy than standard models to your customers? Would you say none of the time, some of the time, most of the time, or every time?

Response Option	Percent (n=53)
None of the time	2%
Some of the time	15%
Most of the time	43%
Every time	34%
Not applicable – I've been involved with the Duke program since starting in the industry/this company	4%
Don't know	2%
Refused	0%

Q7. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS] And what about now?

Response Option	Percent (n=53)
None of the time	0%
Some of the time	7%
Most of the time	36%
Every time	55%
Not applicable – I've been involved with the Duke program since starting in the industry/this company	0%
Don't know	2%
Refused	0%

Q8. Would you say your knowledge of energy efficient products and services has increased, decreased, or stayed about the same since you became involved with the program?

Response Option	Percent (n=58)
Increased	62%
Stayed about the same	36%
Decreased	0%
Don't know	2%
Refused	0%

Q9. [Ask if Q8=INCREASED] Using a 0 to 10 scale, where 0 is "not at all influential" and 10 is "extremely influential," how much influence has the Duke Energy program had on your increased knowledge of energy efficient products and services?

Response Option	Percent (n=36)
0	3%
1	0%
2	8%
3	6%
4	0%
5	14%
6	3%
7	25%
8	17%
9	8%
10	14%
Don't know	3%
Refused	0%

Q10. [ASK IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS] How much more difficult or easier is it to sell 15 SEER central air conditioners now that the code is 14 SEER?

Response Option	Percent (n=41)
Much more difficult	0%
Somewhat more difficult	15%
No different	51%
Somewhat easier	15%
Much easier	12%
Don't sell SEER 15	2%
Don't know	5%
Refused	0%

Q11. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS] How much more difficult or easier is it to sell 15 SEER HVAC heat pumps now that the code is 14 SEER?

Response Option	Percent (n=47)
Much more difficult	2%
Somewhat more difficult	11%
No different	36%
Somewhat easier	28%
Much easier	13%
Don't sell SEER 15	2%
Don't know	8%
Refused	0%

Q12. [ASK IF CONTRACTOR INSTALLED SMART THERMOSTATS] As you may know, Duke Energy offers a rebate for smart thermostats. By how much did your installations of smart thermostats increase since Duke began offering smart thermostat rebates? Would you say…

Response Option	Percent (n=41)
No increase	27%
Some increase	44%
A large increase	27%
Don't know	2%
Refused	0%

Q13. [ASK IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS] Thinking of these higher incentives, did those help you sell more central air-conditioners that are 15 SEER or higher?

Response Option	Percent (n=41)
Yes	71%
No	24%
Don't know	5%
Refused	0%

Q14. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS] Thinking of these higher incentives, did those help you sell more air-source heat pumps that are 15 SEER or higher?

Response Option	Percent (n=47)
Yes	70%
No	21%
Don't know	9%
Refused	0%

Q15. [ASK IF CONTRACTOR PERFORMED QUALITY INSTALLS] As you may know, Duke Energy recently added "quality install" requirements for installations of heat pumps and air conditioners? Were you already doing all the techniques on the quality install check list prior to Duke requiring them?

Response Option	Percent (n=28)
Yes	79%
No	18%
Don't know	3%
Refused	0%

Q16. [Ask if Q15=YES] Prior to using Duke's quality install checklist, did you have a system in place to document that your installers were following these same quality install techniques?

Response Option	Percent (n=22)
Yes	86%
No	14%
Don't know	0%
Refused	0%

Q17. [Ask if Q15=YES] Prior to using Duke's quality install checklist, what specific quality install techniques were you using? Please be as specific as possible.

Response Option	Percent (n=22)
Airflow/static pressure	36%
Blower door tests	18%
System capacity	18%
Condenser measurements	18%
Enthalpy conversion	14%
Duct blaster tests	9%
System CFM	5%
Other	36%
Don't Know	36%

Q18. [ASK IF CONTRACTOR PERFORMED QUALITY INSTALLS ON TIER 2 OR 3 HVAC MEASURES] Do you charge your customers extra on the invoice for completing the quality installation rebate checklist on tier 2 and tier 3 HVAC jobs?

Response Option	Percent (n=23)
Yes	4%
No	91%
Don’t know	4%
Refused	0%

Q19. [ASK IF CONTRACTOR PERFORMED QUALITY INSTALLS] Do you have any suggestions on how Duke Energy could improve the quality install requirements?

Response Option	Percent (n=28)
Yes	71%
Don’t know	25%
Refused	4%

Verbatim Responses	Count (n=20)
When it first came out. There was only one check sheet for all seasons. I like that there are two sheets for different seasons. It's easier to get the rebate processed.	1
They should be more lenient. Sometimes we get apps back from customers and everything has to match with dates. It's difficult to get anything through that's 14 SEER.	1
the only thing I have is when I submit the info for the customer and them it takes 8-10 weeks to process. If there is a problem with the application you contact the Customer and us. If you contacted us before customer so we could fix the issue	1
Stop doing the quality install checklist. That's at the engineering level, not the installation level. I am a licensed contractor, most guys don't have their own license. The processing center is slow, inaccurate, and not very efficient. Go back to the one page fax or email that completed the process, Also, when the contractor got paid.	1
No. the software is kinda difficult when uploading and putting information in. So much that we don't enter the quality pledge. We've ran into too many cases where it was not completed correctly.	1
No	1
Make it easier. Do away with the enthalpy requirements.	1
make it easier. Add more options to the checklist and prorating if added	1
Make it easier to enter into the computer. If you don't want to offer a rebate for a 14 SEER, don't offer a rebate for a quality installation for that 14 SEER.	1
it would be nice to have guidelines where we would need to be so we know if the customer qualifies	1
It is tedious to scan all the documents and put them in. It's a lot of time to input the data to Duke. It would be nicer if the guys in the field could upload the information and get it done there. Like an app on their phone. We do the quality install on each rebate qualified installation, regardless if it's required or not. It would be good if Duke paid the contractor for the extra work and time we are putting into the rebates.	1
If there was an app where it could all be submitted	1
I believe the amount of time it takes to complete the rebates... We don't get anything as a company. It's difficult when you have 200 installs. It's time consuming and the company doesn't want to hire a specific person for just rebates. The existing employees have to be used to process the rebates. Very time consuming.	1
Get rid of it. It takes too long. It's a 2 1/2 hour process.	1
Do away with it. Minimize paperwork sense we're, in essence, working for free for the customer. The less paperwork we're doing for free, the more we would be willing to push the higher efficiency stuff. It would be good to compensate the contractors because we are doing a lot of excessive work and paperwork.	1
Do away with it. It would stop the install department from extra work. It has slowed down the install department. It has really made a hardship on the installation department. If you would give the contractor something for all the extra work.	1
Biggest problem we're having is when we start a house without AC for several days. The AC load is so big inside the house, when you let it run an hour, we will run 160% to 190% capacity above, the requirement is between 80%-180%. To not charge them extra, it's not feasible for us to come back to check it again because duke doesn't give the contractor any incentive. It's a losing proposition. A lot of times we don't do the QI test on the 15 and 16 SEER because we've had the numbers being so wild with the crazy temperatures. We lose the money on a service call if we go	1

Verbatim Responses	Count (n=20)
back out there to get the customer an extra $75.	
Have people who understand the industry creating the process. change the time frame when the inspection needs to be done.	1
Give the dealers something back like you used to	1
Give the company that's doing the rebate some of the rebate. Do away with the quality checklist because it's time consuming. Scanning, putting it in the document, submitting it, attaching is very time consuming.	1

Q20. What energy efficient products, technologies, or services should be added to the Duke Energy rebate program?

Response Option	Percent (n=58)*
Modulating furnaces	2%
Heat recovery ventilation systems	2%
Boilers	0%
Electronically commutated motor furnaces	3%
Tankless water heaters	5%
humidifiers	2%
air handlers	3%
Windows	2%
Doors	0%
No others should be added	38%
Other	34%
Don't Know	21%
Refused	0%

Verbatim Other Responses	Count (n=20)
Wifi Thermostat ONLY (without HVAC)	1
Tier rating for SEER. Keep it easy	1
Solar and the geothermal split system	1
Solar	1
Solar	1
Pool water heaters	1
Package products, because most don't achieve the HSPF minimum requirements even though they're 14 or 15 SEER	1
More Programmable Thermostats, Air filtration systems	1
More models of Smart Thermostats	1
mini split heat pumps	1
Lighting for the pools	1
LED swimming pool lights	1
Energy Audits, figure out what they (Duke) need on Smart Installations	1
Drop the 14 SEER and make efficiency requirements higher	1
Douglas Mini-Splits	1
dealer incentive	1
Crawl Space Insulation	1
being able to upload copies of the bill so the info matches	1
Attic Fan/Ventilation	1
14 SEER without Quality Installation requirement.	1

Q21. Have you attended any orientations or training events from DEC?

Response Option	Percent (n=58)
Yes	33%
No	67%
Don't know	0%
Refused	0%

Q22. [Ask if Q21=YES] What topics were covered in the last Duke Energy event you attended?

Verbatim Responses	Count (n=19)
When the new changes at the first of the year, when they implemented the new rebate system	1
What was being input on the QI	1
What qualified for the rebates	1
Trade ally portal	1
The rebates. How to file them and how much trouble we were having to get through	1
The new rebate system	1
the administrative part of the website	1
Submitting the rebate. Went over the new program.	1
New programs coming out, what is required, educational programs, courses.	1
Just about rebates	1
It was about the Duke rebates and how they worked and how things were processed. And how the system was supposed to operate.	1
Hydraulics and energy consumption on pool pumps.	1
heat pump water heater. went over other programs	1
General Knowledge and Best sales Practices.	1
Duct testing and heat pump training.	1
Duct sealing	1
Duct sealing	1
Different qualifying equipment and the general proceeds on how it works	1
Don’t know	1

Q23. [Ask if Q21=YES] On a scale from 0 to 10, how helpful was the last Duke Energy event you attended?

Response Option	Percent (n=19)
0	0%
1	5%
2	0%
3	0%
4	5%
5	16%
6	0%
7	10%
8	16%
9	0%
10	47%
Don't know	0%
Refused	0%

Q24. What types of training, if any, would you be interested in receiving from Duke Energy?

Response Option	Percent (n=58)
Offered verbatim response	47%
Don’t know	50%
Refused	3%

Verbatim Responses	Count (n=27)
Would like training on all the programs. I would feel like a good training on BPI. It would be good to have air flow training	1
When you update things it would be nice to have a class that would go over that. Also if it is rejected I would like a class going over what we can do.	1
We would like training on going over the different systems	1
Training about the rebates. To make sure we're updated.	1
Thermal class and refresher courses where a contractor could come in and talk	1
Selling points about rebates. Other rebates related to HVAC industry. Up-and-Coming rebate information.	1
Sales for efficiency purposes. Benefits for customer. Technology that is out on Variable speed pump equipment	1
Requirements	1
Open to anything	1
Nothing	1
None	1
None	1
None	1
Net Zero Information.	1
More training on energy efficiency.	1
More paperwork information and more information about the energy efficient products.	1
More of the rebate information. Some of the rebates are very vague.	1
More information for the contractors about when there will be changes and how to adapt to those changes.	1
Love to know when the programs change. Have notification there.	1
Installation or service.	1
How to market the program better	1
Equipment selection. Class for installers to perform the quality install checklist.	1
Energy efficiency and how they would like the process done. What duke energy is looking for in an installation	1
Energy consumption training	1
Duct sealing certification	1
Any and all. The past training has been good.	1
Any communication. When you started this up, we had 2 meetings to understand the rebate processing. There's a LOT that cannot be done on the contractors end.	1

Q25. On a scale from 0 to 10, how interested would you be in a training course on how to effectively sell high efficiency equipment to your customers if it was offered by the program?

Response Option	Percent (n=58)
0	19%
1	9%
2	5%
3	5%
4	2%
5	14%
6	2%
7	15%
8	5%
9	3%
10	17%
Don't know	3%
Refused	0%

Q26. How often do your customers ask about the Duke Energy rebates before you've had the chance to bring them up? Would you say…

Response Option	Percent (n=58)
Never	2%
Rarely	36%
Occasionally	41%
Frequently	14%
Always	0%
Don't know	7%
Refused	0%

Q27. Since Duke transitioned to the online application system in April 2016, how frequently have you experienced problems or frustrations with the rebate application process? Would you say…

Response Option	Percent (n=58)
Never	3%
Rarely	24%
Occasionally	33%
Frequently	28%
Always	10%
Don't know	2%
Refused	0%

Q28. [Ask if Q27=RARELY, OCCASIONALLY, FREQUENTLY, OR ALWAYS] What types of problems or frustrations did you experience?

Verbatim Responses	Count (n=55)
A couple quality installation checklist issues with the 14 SEER. This may have been an issue on our end.	1
Don't know	1
When we first started, getting everyone on the same page was difficult.	1
The online process is frustrating. It's easier now. To get the documentation in the thermostat is where we've struggled. Not being able to go in and attach information later. Info was entered, but it was frustrating you could not edit it.	1
Rebates declining for no reason	1
Right now, I have 4 that say "attention required" and I have to call a Duke representative, Aaron, to find out exactly what's wrong. It just tells me "Invalid reason, the smart thermostat number cannot be validated". Before, when I would send in a thermostat, we were just using the complete model number. Now we need to enter it "exactly as they appear on the product list". It's a simple fix, but I need to look twice. "The quality installation did not meet program requirements". If they would tell exactly why something would not qualify so I did not have to contact Aaron, it would save a lot of time. I think we should not have to call someone for every reason it says "Attention Required". Give us a reason on your website WHY the rebate needs attention. Contractor contacts Aaron at Duke, then Aaron has to contact Blackhawk. Then Blackhawn needs to respond to Aaron and he can get back to me. This takes a lot longer than it should. We should be working directly with the vendor that gives the rebates. I have a rebate we did 5/10/17 that says "Attention required-Rejected-The account holder name does not match the application name" Glen vs Glenn was the only issue with this. I sent the account number in with this application but it was still rejected because of an extra N in the customer name Glen.	1
Always kicking out application saying not enough info.	1
Submitting the rebates	1
Rejections are bring sent out before resolved. sounds like there may be a glitch	1
There were issues with model numbers and rebates not going through. Customers call back to ask where there rebates were. Some issue with Insurance not updating.	1
It is very frustrating to start with. then you need to resubmit. So you resubmit and it wouldn't do anything. If you click resubmit, it would not work, so you had to start over. It's gotten better, but the old system was easier in some ways. I like the online, without paper.	1
If it declined the application, or said it had an issue, it never told you exactly what the issue was. Simple things like the name on the paperwork being husband and wife, and the bill was just the husband would not work. I misspelled an address once, and I had to call Duke instead of just seeing what the problem was and fixing it online.	1
Feedback information from Duke as far as status and delay of rebates.	1
All the attachments are time consuming.	1
Mostly with Quality Checks and 14 SEER.	1
It needs attention and we call Duke and find out we're not able to complete the rebate on our side. Calling duke takes a lot of time. Tracking. Status Updates on OLD rebates that still say "in review". The system went down for a week or two for a manual update, we should get a warning if you're going to update the system.	1
It's the inability to change something that's been input within 48 hours. As soon as I enter a rebate, I might get a call from an installer to change the name or address. I cannot change the info for 48 hours. Once I update something, regarding MY Account, it takes days or up to a week before I can	1

Verbatim Responses	Count (n=55)
submit rebates or receive referrals. It's like someone needs to approve it at Duke. This mostly affects referrals.	
When you switch from winter to spring it would take a while to get the different checklist up	1
Applications were not showing up	1
The last one I had needed a qualified thermostat. When I called customer service, they said it was qualified, but the price was messed up in the system. Customer service fixed it for me. It usually has to do with the thermostat.	1
The process was a little slow at times.	1
Sending in/Scanning info that is sent and has never been received. Lost information.	1
Wouldn't accept the application and said it wasn't right.	1
No guide to the quality installation process. It requires certain things that you need to test at certain times of the year according to outdoor temp. No guide to CFM, I just have to guess the numbers because Duke doesn't tell where to test the CFMs	1
Confusion with the system would enter info and it would say it was unfinished	1
Just when I'd go back to track the process, it'd say it would need more paperwork. When I was uploading, I had to split up the files instead of processing it all in one file.	1
Homeowners were getting things sent saying there was an issue with the rebate.	1
Mostly just the beginning, when we were trying to switch the program over. When it was initially setup, you could get an extra rebate for a certain thermostat. The system kept asking me to submit specific paperwork for a thermostat that the customer did not order.	1
Started before 2016. Thought we'd never get the first few rebates to process.	1
Never got an email about an issue	1
Just once I could not get the site to load. Just an issue with Cookies and Cache, I think. Once it didn't accept a serial number and kicked back an application.	1
Incorrect info provided and having trouble getting it corrected.	1
It kept adding more requirements that you had to have on the paperwork that needed to qualify. Kept adding things that need to be on there. The paper that we'd fax was much easier than using the scanner. When you're limited on time, having to scan and then upload to a computer is frustrating. The address and names are VERY PICKY and would kick back, then we need to call to address the issue. It should be more human friendly, simpler to find discrepancies. Husbands/Wives is the same thing. If the husband on the power bill and both are on the rebate, it will kick it back and we have to call to get an answer on the issue. We don't get paid for the rebate. There's no incentive for the contractor, but we need to do them because the customer wants the savings.	1
When you try to track a rebate, part of its missing. Information is wrong. Double rebates, duplicated applications, then the application would be gone. Would not take specific wording. Have a hard time uploading documents, as well.	1
You have to upload everything, scan it, put the QI think and invoice together and then upload it.	1
Losing paperwork on Dukes side. Denying claims that were properly done. Paying out less than what the claim was. Long time delays between completing a claim and finding out if it was accepted. Many frustrated customers who didn't receive their claim that they were supposed to, in a timely fashion. It's really hard to have customers angry with us when it was Duke who was being slow on the process.	1

Verbatim Responses	Count (n=55)
After you fill out the application, it takes about 30 days to get it back. Sometimes I would end up duplicating the application because it would take so long. It's very unforgiving because it will cancel the rebate after 60 days. 1 or 2 things that are not entered will reject the rebate.	1
When things get denied that should not be denied. They get kicked out and when I call Duke, they say "that shouldn't have been denied" and then approve. Whenever I call, except one, it has been erroneously denied. The one I messed up on was because the homeowners name was different from the account holder.	1
Estimation work. Insurance certificates. Quality Checklist, filling out and submitting it. If the customer didn't want the WiFi thermostat, Duke would reject the refund. The communication back and forth is horrible. The ease of uploading files is not user friendly.	1
When we first started using it was rejecting a lot of applications saying need more details. When we called, I was told it was a glitch	1
It took Duke 2 months to create our profile so we could submit rebates. It took 6-7 phone calls and 1 to management to realize the IT issue was on Dukes end. I had to get special approval to get expired rebates approved because of the IT issue. I had several customers upset because of the delay on their rebates.	1
The initial onset is having a hard time adding a new user. The referral program is harder to navigate	1
Giving me errors when accessing the application	1
What we see says the application was accepted and paid but the customer gets a letter saying it's rejected.	1
I didn't know the server was going to be down for updates. I didn't get any notification. When I was trying to do my billing, I could not.	1
Having to submit new paperwork for things that were already submitted in the online portal.	1
First, it was in a foreign language. Asking for additional paperwork that I had already submitted. On follow-up, it takes forever for DUKE to respond to the submission, it gets too close to the deadline. They say it takes 24 hours, but in reality, it takes 2-3 weeks to get back.	1
Getting the whole program setup. It kept getting pushed back. But now it works just fine.	1
There was quite a while where I had to go to different browsers to get it to work because I couldn't stay logged in.	1
Would not let me submit all the way. Would say it was submitted but would not be in my portfolio	1
The portal and when you scan a document they want you to send in.	1
Names not matching on the accounts	1
Worst part is that it would not go anywhere. I called and was told to use Google Chrome instead of Internet Explorer. As long as I get my numbers in right, it works smooth.	1
Can't enter the information. System is down.	1
Thermostat model number cannot be validated.	1

Q29. [Ask if Q27=RARELY, OCCASIONALLY, FREQUENTLY, OR ALWAYS] Overall, have these problems persisted or gotten better over time?

Response Option	Percent (n=55)
Persisted	24%
Gotten somewhat better	58%
Have been completely resolved at this point	18%
Don't know	0%
Refused	0%

Q30. Do you have any suggestions on how Duke Energy could improve the rebate application process?

Response Option	Percent (n=58)
Verbatim response offered	62%
Don’t know	33%
Refused	5%

Verbatim Responses	Count (n=36)
Allow things to be attached or addendum to be done.	1
Have better training for your employees	1
Let the home owner do the application like they did before. Keep the contractors out of it because we are not compensated for any of these rebates. Let the homeowner fill out the information. Contractor can give the homeowner the Model, Serial number, and invoice and the home owner can send in the information.	1
If it is duke energy or duke progress it should be the same application.	1
Makes the system faster	1
Make the customers file instead of the contractor.	1
Not have to do a checklist for 14 SEER. Add more programmable thermostats that are applicable. The duct work should be a little more lenient.	1
Keep the questions on the rebate application worded similarly, or more simple. E.X. There's a question on the pool pump application regarding the horsepower on Old and New that is hard to determine which line I am supposed to put the information for the old pump or the information on the new pump.	1
Pay the company that's submitting it. Go back to the rebate for the contractor.	1
More leniency on quality checklist being submitted with applications.	1
Give it back to the customer. Let the customer submit it. Contractor puts the equipment on the form and hands the form to the customer. Take it out of the hands of the contractor.	1
Make it more human friendly. Make the requirements be more user friendly and not kick back because simple things like the names don’t match exactly.	1
Maybe try to get the software to work better.	1
If you'd stop the QI, it would speed it up a whole lot. I've scanned over 50 rebates this morning, double checked everything, and it takes a LOT OF TIME.	1
Go back to the old way that worked. Go back to the one page that was faxed in with the customer name, number, what was installed and an AHRI number. The claims department is the problem. All the things that are requested are way over the top and at the engineering level, not the installer level.	1
It asks what the total cost is, this is not necessary information, then you ask for the price of the thermostat, but we price our jobs as a whole. There are redundant and ridiculous questions on the online forms. They don’t have anything to do with efficiency or SEER rating.	1
Streamline the process. There's 4 documents I have to scan and that takes a lot of time.	1
Less paperwork. Be more user friendly. Less work for the contractor. Compensate the contractor for the extra time. Go back to faxing the paperwork.	1
wait until the application process has been looked at before rejecting the application	1
If the customer doesn't qualify, would be nice to be able to delete the application.	1
Scanning and uploading was hard at first. I've gotten used to it and it works just fine when the scanner works.	1
Pay the contractors some of the rebate as well. Especially because we have to do the rebate paperwork. We interact if the customer has any questions.	1
It would be great if there were some kind of check system where it would validate the info immediately	1

Verbatim Responses	Count (n=36)
Give the contractor back the incentive	1
Easier use of the portal.	1
Giving the option to upload sheets electronically	1
Shorter Forms.	1
When there's a problem (like checking a box or if something doesn't match) with an application, make it easier to fix it online instead of calling Duke to get it corrected.	1
I feel that it's redundant to answer electronic questions in the applications. They're the same as the paperwork. That's not good time management to be required to submit them on paper AND be required to submit them electronically within the application online.	1
Making an app where you can scan the equipment tags. automatically input AHRI	1
If it is just A/c only make it so it bypasses the indoor info	1
Be more detailed in what the rebate is for. Not so many choices.	1
The whole Visa Gift Card Card Thing. I've had 1/2 of my customers contact us again wondering when they filed, when they'll get the rebate, when it was completed, when it was sent. I have to have the customer give Duke a call to get the information because it's been over 6 weeks.	1
Downsizing what needs to be submitted	1
Make it faster. Faster turn around for processing and rejecting (if applicable). Respond back to the contractor when a customer gets paid a rebate. Make it more clear to the contractor when, and how much, a rebate has been paid to the customer.	1
They could go back to giving the contractor money as well as the customer.	1

Q31. Do you have any suggestions on how Duke Energy could improve the project inspection process?

Response Option	Percent (n=58)
Verbatim response offered	19%
Don't know	76%
Refused	5%

Verbatim Responses	Count (n=11)
It requires a lot of data and man hours and it isn't worth it to do it	1
No	1
None	1
No	1
None	1
I don’t think I've ever had them inspect one of my project.	1
Stop it! We usually do a load calculation to make sure we're welling the right equipment. If the SEER rating is there, the ECM motor is there, there's no need for an inspection.	1
None	1
I think most of it works really well. It would be nice if there was an auto-fill option on the website.	1
I don’t know too much about it.	1
Nope	1

Q32. Please rate the extent to which you are satisfied with the following aspects of the program using a 0 to 10 scale. How satisfied are you with:

Program training offered by Duke

Response Option	Percent (n=58)
0	3%
1	2%
2	2%
3	2%
4	5%
5	24%
6	7%
7	5%
8	10%
9	3%
10	17%
N/A	12%
Don’t know	3%
Refused	0%

Your Duke energy trade ally representative

Response Option	Percent (n=58)
0	10%
1	12%
2	0%
3	0%
4	0%
5	29%
6	3%
7	9%
8	7%
9	5%
10	34%
N/A	5%
Don't know	7%
Refused	0%

The program website for customers

Response Option	Percent (n=58)
0	2%
1	0%
2	2%
3	%
4	2%
5	10%
6	2%
7	12%
8	3%
9	3%
10	10%
N/A	19%
Don't know	34%
Refused	0%

The trade ally portal applications tracking system

Response Option	Percent (n=58)
0	3%
1	3%
2	3%
3	0%
4	9%
5	5%
6	5%
7	14%
8	19%
9	12%
10	26%
N/A	0%
Don't know	0%
Refused	0%

The marketing of the program

Response Option	Percent (n=58)
0	2%
1	0%
2	0%
3	3%
4	3%
5	29%
6	5%
7	10%
8	12%
9	2%
10	17%
N/A	7%
Don't know	9%
Refused	0%

The incentive applications submission process

Response Option	Percent (n=58)
0	3%
1	2%
2	3%
3	3%
4	9%
5	10%
6	5%
7	16%
8	16%
9	7%
10	22%
N/A	2%
Don't know	2%
Refused	0%

The selection of eligible equipment and services

Response Option	Percent (n=58)
0	0%
1	2%
2	0%
3	0%
4	3%
5	14%
6	9%
7	12%
8	24%
9	5%
10	29%
N/A	0%
Don't know	2%
Refused	0%

The overall program

Response Option	Percent (n=58)
0	2%
1	3%
2	5%
3	2%
4	0%
5	9%
6	5%
7	19%
8	21%
9	14%
10	21%
N/A	0%
Don't know	0%
Refused	0%

Q33. [ASK IF ANY ANSWER IN Q32 < 5] Please explain why you were dissatisfied with:

Program training offered by Duke Energy

Verbatim Response	Count (n=8)
I don't know that I've been offered training for it. I don't know what you're talking about.	1
Didn't even know it was there.	1
Never had any offered to me. I didn't know it existed.	1
I have never received any training or any notification about it.	1
See previous answer.	1
There isn't really any training. I haven't received any training.	1
They haven't provided any within the last year.	1
Don't know	1

Your Duke energy trade ally representative

Verbatim Response	Count (n=7)
I don't know who he is. Lack of communication with me or our company.	1
Didn't even know that I had one.	1
They don't return calls or emails. I'm not sure who it is because it changes regularly.	1
That's the company that handles the rebates. It's awful now. The feedback, website, insurance is difficult.	1
Never had any contact with him. Emailed 3 times and got no response.	1
I haven't from anybody	1
Not aware they exist.	1

The program website for customers

Verbatim Response	Count (n=3)
Don't know	1
Don't know	1
Ease of use.	1

The trade ally portal applications tracking system

Verbatim Response	Count (n=11)
Slow Process	
It's not up to date. It doesn't report. It's just not accurate.	
Mostly because of the length of time to get a response if it was been approved. If it does not get approved, it's been 30 days and gets entirely rejected after 60 days.	
It's just not correct. I have to call in a lot and then they put the application on hold for days. I end up calling a lot.	
Ease of use. Not user friendly. Upload hard.	
If it's in review, it won't tell you why. I don't know why applications pass or fail.	
Don't know	
Some have gotten to be taken care of, but mostly never gets updated on my end.	
needs more information. It needs when the customer has been paid	
It takes a little while to upload, if there is information put in wrong, can't go back and fix it. Doesn't tell me what is wrong all the time, most the time I have to call. The way it wants us to fix things is silly.	
It doesn't show that the customer has been paid their rebate. The rebates just seem to disappear and I am unable to find that they've been processed.	

The marketing of the program

Verbatim Response	Count (n=5)
Don’t know	1
Don’t know	1
Never seen any marketing.	1
hasn't really looked at the website	1
I've never seen marketing as a customer or a contractor.	1

The incentive applications submission process

Verbatim Response	Count (n=12)
Don’t know	1
It just doesn’t take what I put in there.	1
I can change that to a 5 of 10. The submission is fine, the requirements are inadequate.	1
Slow Process. Inaccurate. False Results. People I know FOR A FACT that qualify that don’t get the rebate, then the contractor looks like a liar.	1
Some of the questions don’t seem relevant.	1
Ease of use. Difficult sense last switch to new rebate company	1
The other way was so simple. For us to not get any compensation, except a referral (which I have not received), this takes the installers 1 hour extra and takes 45 minutes in paperwork to submit the rebate.	1
It's a pain in the butt. It's extra work I need to do to get a rebate for the customer and I don’t get anything out of it. It's extra work to do.	1
not sure if you will be accepted	1
they require a lot of information.	1
It's redundant. I upload hand written paperwork that's identical to the electronic application. Considering the number of applications our company submits.	1
It takes too dang long. It's very tedious.	1

The selection of eligible equipment and services

Verbatim Response	Count (n=3)
Don’t know	1
Because of the quality installation program for extra money. It's too time consuming. It costs the contractor more money than Duke is offering the customer. It costs us too much labor. You should just do away with the quality installation program.	1
I don't feel that 14 SEER equipment should get a rebate. Also there are other thermostats out there that are not the list. The heat pump package unit should be included.	1

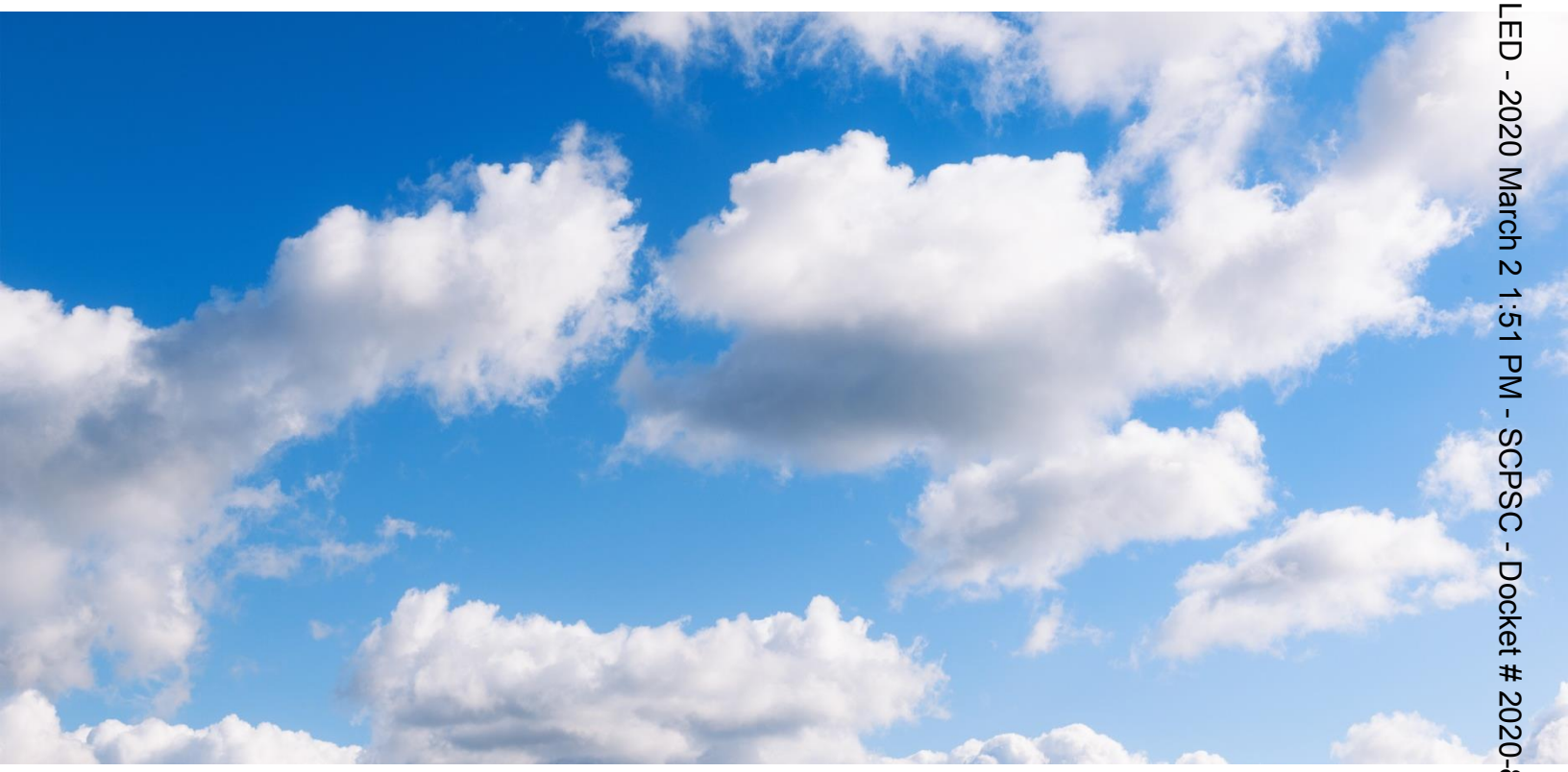
The overall program

Verbatim Response	Count (n=7)
It was easy to deal with when you were using good-sense to submit applications. The PDF applications were much easier. If anything is wrong, now, it really makes this frustrating.	1
I don't think there's enough marketing. It's too difficult for any product under 15 SEER	1
Too much of a hassle. Unhappy customers. Slow. Bad results. Too complicated. NO incentive for contractors.	1
I've been here for 2 years, a guy applied for a rebate in Feb 2015 and he didn't get his rebate until late spring 2016. He would call me every three weeks. I would call duke and get different answers from different representatives. Despite the many re-submissions and reasons, he finally got his rebate. From a company standpoint, you put all the work on the contractor and the contractor needs to pay to do your rebate application. You don't give an incentive to the contractor.	1
Ease of use. Difficult sense last switch to new rebate company	1
it is a big hassle. Every time something is wrong they send a card to the customer	1
Quality Inspection Process is really the killer. It takes too much time to complete.	1

Q34. Thanks so much for your time today. Are there any other comments you would like to provide?

Verbatim Response	Count (n=13)
What is a Duke energy contracted truck?? I see smaller vans that says "Duke Energy Contracted" and they're not just meter readers, they were doing something else. I don't know what they were doing.	1
We already try to sell higher end stuff. This is just extra work we are doing to get the customer money. You can't go from paying someone to do something to making it WAY harder and not paying them anymore.	1
they ought to offer the dealer some incentive like they before for doing all the paperwork.	1
Sometimes our customers get a pre-paid visa card, sometimes a check. It would be nice to know what determined which one they will receive so that we can tell our customers. For people who are not as technologically enhanced, a check would be MUCH NICER than a VISA card.	1
Please start paying the contractors for the rebate paperwork and making sure the installations are done correctly. This all takes time. Do away with the 14 SEER rebates and start at a higher SEER level.	1
on the portal when it says it is in review it could give more of an explanation on if it was completed and when the card was mailed	1
My experience is that most HVAC companies will offer their own rebates because of the Quality Install process. The percentages and calculations that Duke is asking for is very redundant and pointless. Because the contractors are supposed to have the inspection done by the county, the quality install process is not necessary.	1
It would be nice if Duke would offer incentive the people that install the rebated equipment.	1
I'm very upset that my employer has to pay me a salary to process the rebates and he gets no compensation for it.	1
I wish you would provide an incentive to the contractor. I wish you hadn't taken our incentive because it is extra work. We should be paid for the time it takes us to submit the rebate	1

Verbatim Response	Count (n=13)
paperwork.	
give money back to the dealers	1
A lot of the time when someone else gets the job they will send us a thing that requires us to look at their reference number. On the paper it says "Loss". When I check it, it shows that the people never call us to give them a quote. That is just wording. Marketing can improve. We get a lot of referrals but we don't have a lot of people that call us. Put a check box that asks the customer if they would like us to call them or not. That will improve rebates and business for contractors.	1
Get rid of the quality checklist/quality inspection.	1



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EM&V Activities

Planned Evaluation, Measurement and Verification (EM&V) Activities through the rate period (Dec. 31, 2020)

Evaluation is a term adopted by Duke Energy Carolinas (DEC), and refers generally to the systematic process of gathering information on program activities, quantifying energy and demand impacts, and reporting overall effectiveness of program efforts. Within evaluation, the activity of measurement and verification (M&V) refers to the collection and analysis of data at a participating facility/project. Together this is referred to as "EM&V."

Refer to the accompanying Evans Exhibit 12 chart for a schedule of process and impact evaluation analysis and reports that are currently scheduled.

Energy Efficiency Portfolio Evaluation

DEC has contracted with independent, third-party evaluation consultants to provide the appropriate EM&V support, including the development and implementation of an evaluation plan designed to measure the energy and demand impacts of the residential and non-residential energy efficiency programs.

Typical EM&V activities:

- Develop evaluation action plan
- Process evaluation interviews
- Collect program data
- Verify measure installation and performance through surveys and/or on-site visits
- Program database review
- Impact data analysis
- Reporting

The process evaluation provides unbiased information on past program performance, current implementation strategies and opportunities for future program improvements. Typically, the data collection for process evaluation consists of surveys with program management, implementation vendor(s), program partner(s), and participants; and, in some cases, non-participants. A statistically representative sample of participants will be selected for the analysis.

The impact evaluation provides energy and demand savings resulting from the program. Impact analysis may involve engineering analysis (formulas/algorithms), billing analysis, statistically adjusted engineering methods, and/or building simulation models, depending on the program and the nature of the impacts. Data collection may involve surveys and/or site visits. A statistically representative sample of participants is selected for the analysis. Duke Energy Carolinas intends to follow industry-accepted methodologies for all measurement and

verification activities, consistent with International Performance Measurement Verification Protocol (IPMVP) Options A, C or D depending on the measure.

The field of evaluation is constantly learning from ongoing data collection and analysis, and best practices for evaluation, measurement and verification continually evolve. As updated best practices are identified in the industry, DEC will consider these and revise evaluation plans as appropriate to provide accurate and cost-effective evaluation.

Demand Response Program Evaluation

DEC has contracted with independent, third-party evaluation consultants to provide an independent review of the evaluation plan designed to measure the demand impacts of the residential and non-residential demand response programs and the final results of that evaluation.

Typical EM&V activities:

- Collect program data
- Process evaluation interviews
- Verify operability and performance through on-site visits
- Collect interval data
- Program database review
- Benchmarking research
- Dispatch optimization modeling
- Impact data analysis
- Reporting

The process evaluation provides unbiased information on past program performance, current implementation strategies and opportunities for future improvements. Typically, the data collection for process evaluation consists of surveys with program management, implementation vendor(s), program partner(s), and participants; and, in some cases, non-participants. A statistically representative sample of participants will be selected for the analysis.

The impact evaluation provides demand savings resulting from the program. Impact analysis for Power Manager involves a simulation model to calculate the duty cycle reduction, and then an overall load reduction. Impact analysis for PowerShare involves statistical modeling of an M&V baseline load shape for a customer, then modeling the event period baseline load shape and comparing to the actual load curve of the customer during the event period.

The field of evaluation is constantly learning from ongoing data collection and analysis, and best practices for evaluation, measurement and verification continually evolve. As updated best practices are identified in the industry, DEC will consider these and revise evaluation plans as appropriate to provide accurate and cost-effective evaluation.

EM&V EFFECTIVE DATE TIMELINE

This chart contains the expected timeline with end of customer data sample period for impact evaluation and when the impact evaluation report is expected to be completed.
Unless otherwise noted, original impact estimates are replaced with the first impact evaluation results, after which time subsequent impact evaluation results are applied prospectively.

Program	Program/Measure	2015				2016			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Appliance Recycling	Refrigerator, Freezer			2nd EM&V	Report				
Energy Efficiency Education (K12 Curriculum)	Energy Efficiency Education (K12 Curriculum)			3rd EM&V	Report				
Energy Efficient Appliance and Devices	Lighting - Smart Saver RCFL			3rd EM&V	Report				
	Lighting - Specialty Bulbs								
	SF Water EE Products			1st EM&V	Report				
	HP Water Heater & Pool Pumps								
HVAC Energy Efficiency	Residential Smart $aver AC and HP								
	Tune & Seal Measures								
Income-Qualified Energy Efficiency	Weatherization								
	Refrigerator Replacement								
	Low Income Neighborhood							2nd EM&V	Report
Multi-Family Energy Efficiency	MF Water EE Products			1st EM&V	Report			2nd EM&V	Report
	Lighting (CFL Property Manager)								3rd EM&V
My Home Energy Report	MyHER								
Residential Energy Assessments	Home Energy House Call								
Non-Residential Smart $aver Energy Efficiency Custom	Non-Res Smart$aver Custom Rebate								
Non-Residential Smart $aver Energy Efficiency Food Service	Non-Res Smart $aver Energy Efficiency Food Service				2nd EM&V				2nd EM&V
Non-Residential Smart $aver Energy Efficiency HVAC Products	Non-Res Smart $aver Energy Efficiency HVAC Products				2nd EM&V	Report			
Non-Residential Smart $aver Energy Efficiency Lighting	Non Re Smart Saver Prescriptive Lighting								
	Non Res Smart Saver Prescriptive Other							1st EM&V	Report
Non-Residential Smart $aver Energy Efficiency Motors Pumps Drives	Non-Res Smart$aver Prescriptive (VFDs or other)				2nd EM&V				
Non-Residential Smart $aver Energy Efficiency Process Equipment	Non-Res Smart $aver Energy Efficiency Process Equip				2nd EM&V				
Small Business Energy Saver	SBES								
Smart Energy in Offices	SEiO								

Key
- Original Estimate
- 1st EM&V
- 2nd EM&V
- 3rd EM&V
- 4th EM&V
- 5th EM&V
- 6th EM&V

Program	Program/Measure	2017				2018				2019				2020			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
~~Appliance Recycling~~	~~Refrigerator, Freezer~~																
Energy Efficiency Education (K12 Curriculum)	Energy Efficiency Education (K12 Curriculum)								4th EM&V	Report							5th EM&V
Energy Efficient Appliance and Devices	Lighting - Smart Saver RLED (Free LED)			1st EM&V	Report												
	Lighting - Smart Saver Retail					1st EM&V	Report										
	Lighting - Specialty Bulbs							2nd EM&V	Report								
	SF Water EE Products			2nd EM&V	Report								3rd EM&V	3rd EM&V	Report		
	HP Water Heater & Pool Pumps					1st EM&V	Report										
HVAC Energy Efficiency	Referral and Non-Referral HVAC Measures					2nd EM&V	Report										
Income-Qualified Energy Efficiency	Weatherization					1st EM&V	Report								2nd EM&V	2nd EM&V	Report
	Refrigerator Replacement					1st EM&V	Report								2nd EM&V	2nd EM&V	Report
	Low Income Neighborhood											3rd EM&V	Report				
Multi-Family Energy Efficiency	Lighting & Water EE Products												3rd EM&V	Report			
My Home Energy Report	MyHER	Report								4th EM&V	Report						5th EM&V
Residential Energy Assessments	Home Energy House Call							3rd EM&V	Report							4th EM&V	Report
~~Business Energy Reports~~	~~BER~~				~~1st EM&V~~	~~Report~~				~~Report~~							
EnergyWise Business	EnergyWise Business (EE measure)	1st EM&V	Report				2nd EM&V	Report									
Non-Residential Smart $aver Energy Efficiency Custom	Custom Rebate & Custom Assessment	Report						3rd EM&V	Report							4th EM&V	Report
Non-Residential Smart $aver Prescriptive	All Prescriptive Technologies					3rd EM&V	Report						4th EM&V	Report			
Non-Residential Energy Assessment			1st EM&V	Report													
Small Business Energy Saver	SBES						2nd EM&V	Report									3rd EM&V
Smart Energy in Offices	SEiO			1st EM&V	Report												

Note: Residential Smart $aver AC and HP and Non-Residential Prescriptive lighting measures have completed a additional EM&V report in the past. Future reports combine measures for the respective programs.

Program	Program/Measure	2021			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4
~~Appliance Recycling~~	~~Refrigerator, Freezer~~				
Energy Efficiency Education (K12 Curriculum)	Energy Efficiency Education (K12 Curriculum)		6th EM&V	6th EM&V	Report
Energy Efficient Appliance and Devices	~~Lighting - Smart Saver RLED (Free LED)~~				
	~~Lighting - Smart Saver Retail~~				
	Lighting - Specialty Bulbs/Retail Marketplace			3rd EM&V	Report
	SF Water EE Products				4th EM&V
	HP Water Heater & Pool Pumps			2nd EM&V	2nd EM&V
HVAC Energy Efficiency	Referral and Non-Referral HVAC Measures			3rd EM&V	3rd EM&V
Income-Qualified Energy Efficiency	Weatherization				
	Refrigerator Replacement				
	Low Income Neighborhood				
Multi-Family Energy Efficiency	Lighting & Water EE Products				
My Home Energy Report	MyHER		5th EM&V	Report	
Residential Energy Assessments	Home Energy House Call				
~~Business Energy Reports~~	~~BER~~				
EnergyWise Business	EnergyWise Business (EE measure)				
Non-Residential Smart $aver Energy Efficiency Custom	Custom Rebate & Custom Assessment	4th EM&V	Report		
Non-Residential Smart $aver Prescriptive	All Prescriptive Technologies				5th EM&V
Non-Residential Energy Assessment					
Small Business Energy Saver	SBES	Report			
~~Smart Energy in Offices~~	~~SEiO~~				